THE PRACTICAL PAINTER AND DECORATOR

ILLUSTRATED

A comprehensive and authoritative introduction to the most modern methods of painting and decorating for learners and more experienced craftsmen

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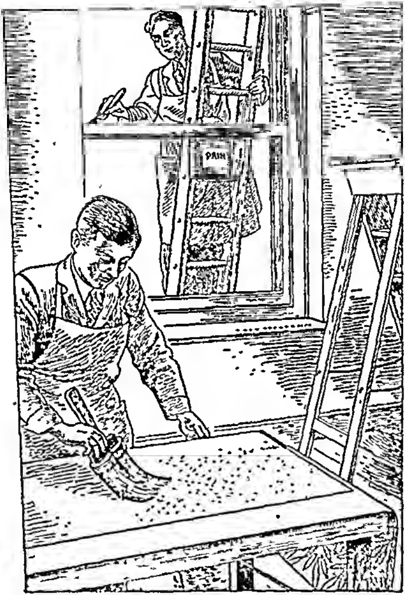

WORK WHICH HAS TWO VITAL PURPOSES

It should be remembered by craftsmen that painting and decorating have two purposes : enhancement of aesthetic values and preservation of building fabrics.

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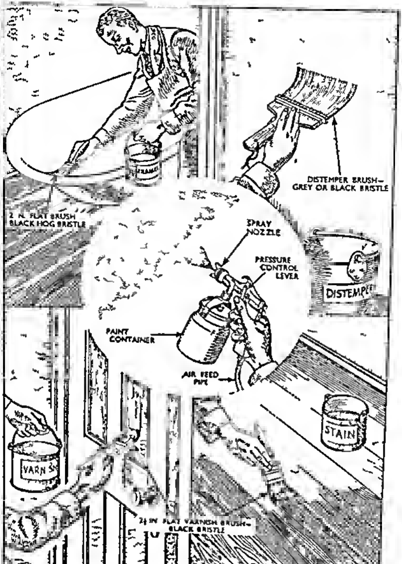


TOOLS FOR APPLYING WIDELY USED MATERIALS

The careful selection of suitable tools for various materials and processes is of vital importance. In the above illustration are shown some of the most frequently used brushes and a spray gun for spraying paint. Note the way each tool is held

CHAPTER I

MATERIALS

COMPOSITION OF PAINT   PIGMENTS   FIXED AND VOLATILE DRYING OILS   CHLORINATED RUBBER AS A PAINT MEDIUM   SOLVENTS AND THINNERS   COLOURED PIGMENTS   OIL CONTENT OF DIFFERENT COLOURS   SPREADING CAPACITY   PAINT MIXING   INTERMEDIATE AND FINISHING COATS   VARNISH PAINT   KNOTTING   STOPPING AND FILLING-UP COMPOSITIONS   ABRASIVES   PLANNING PAINT-SHOPS AND STORES   STORING PLANT AND SCAFFOLDING

THERE can be no other craft which has advanced and is still advancing to the extent of painting and decorating Both its artistic aspects and technique are continually developing

Consequently, there is always a great deal that even the most experienced workman can learn about this trade if he desires to keep right up to date in his knowledge of the craft And obviously the learner and apprentice must acquire an understanding of the most modern principles in order to qualify for the better and more highly paid positions The first step that should be taken is to gain a sound knowledge of the materials employed

A painter who knows the essential facts regarding the correct use limitations and chemical properties of all types of paints and varnishes, can apply his skill with the certainty of superior results

Paint Composition

So we will commence with a survey of the composition of paint This important material whether intended for brush or spray application or even for dipping purposes (painting by immersion) is composed of ingredients with certain definite functions to perform The simplest type, water paint or distemper, consists of one or more pigments, a binding or fixing agent (usually glue size), and requires only water as a thinner The drying action is due entirely to the evaporation of the water content, leaving the pigment attached to the surface by a weak form of glue

Four Ingredients Required

Oil paint is more interesting and complicated in its composition and subsequent action Four ingredients are required, namely, the pigment (ground in oil), the medium or binding agent (usually linseed oil), a drying agent (paste or liquid), and a thinner, which is usually turpentine

Pigments provide body or solid substance, the characteristic colour, opacity (the quality of hiding the surface beneath) (Fig 1), and, if properly selected, have an important part to play in the life and durability of a paint film It is, of course, essential that a pigment should be insoluble in the medium and thinner employed, that it should not have an injurious effect upon the medium or upon other pigments, and that it should be permanent both in colour and structure Other important qualities such as fineness

luminosity (i.e the ability to reflect light), and in many other respects

How these features affect the painter will best be gathered from the following Its chemical nature may be such as to render a pigment inert and, therefore, unaffected by admixture with other colours, it may also be proof against the destructive action of dilute acid or alkaline solutions or against sulphurous fumes Other colours may be so chemically active as to 'bleed' or percolate through superimposed coats of paint Others are discoloured when intermixed or when in contact with lime or even when they are exposed to mild sulphurous gases

Variations in Pigments

Some pigments, particularly those of the lead group, are exceptional in their drying properties and also in the favourable manner in which they react with linseed oil Others have a hardening effect upon the oil a quality which speedily reduces elasticity and leads to 'chalking' or even 'flaking' of the paint

The degree of fineness of the particles of pigment is of the utmost importance in determining the opacity, luminosity, staining strength, spreading capacity, and durability of a paint, coarsely-ground materials being decidedly inferior in all these qualities Where, by reason of its soft and porous nature, a material is deficient in structural strength, this can often be rectified by the addition of another material possessing a hard micro-crystalline structure On the other hand, very light, bulky materials help to support those of greater weight when required for spray application flat wall finishes, etc, where the necessary full coatings are liable to run

It will be seen that few pigments possess all the qualities necessary for absolute all-round perfection, but there are occasions when the absence of some particular quality renders a material especially valuable for some decorative purpose Staining and glazing are instances where lack of opacity in the pigment largely contributes to the rich translucent appearance of the work Durability in these cases must be obtained by varnishing

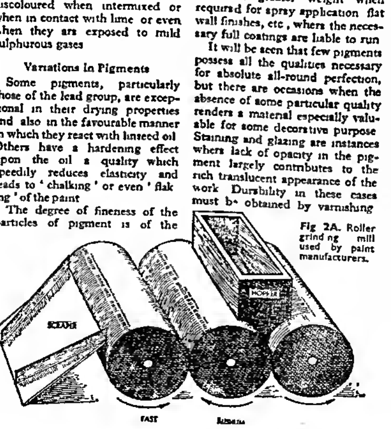


Fig 2A. Roller grinding mill used by paint manufacturers.

which also helps to improve the permanence of the more fugitive colours which tend to fade upon exposure to light

White Lead (basic carbonate of lead) (sp gr 6 6) is also sold under the name of *Flake White* This pigment, well known for some 2,000 years, is the standard white base from which many paints are prepared It is produced by various methods, chief of which are the "Dutch" or "Stack" process (requiring 3 months) (Fig 3), the "Chamber" process (requiring 2 months) and by direct chemical reaction (a 2-day process) All are complicated processes difficult to control, but the resulting pigments, which should in all cases contain approximately 70 per cent lead carbonate to 30 per cent lead hydroxide, and should, theoretically, be equal, are found to differ slightly in initial cost, fineness, porosity, and working qualities

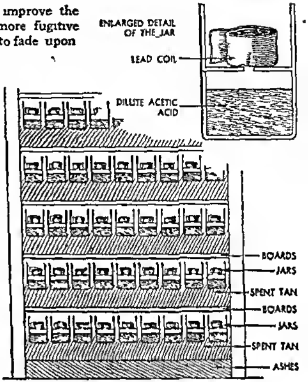


Fig 3 Diagram showing a section of the apparatus used in the production of white lead by the ' Dutch ' or ' Stack'' process which is one of the chief methods

Stack and Chamber Lead

Stack lead, usually specified in important contracts, has long been regarded as the best but in view of the increasing demand for and recent improvements in lead produced by the other processes it would be unwise to be dogmatic on that point The writer has for some years used and compared both stack and chamber lead and has found little difference except in spreading capacity, the higher oil absorption of the chamber lead enabling a rather larger surface area to be covered per hundredweight of stiff paste

White lead, on account of its weight and fineness of particles, is very opaque, but the former property limits the spreading capacity of the paint It does, however, work with remarkable smoothness under the brush and has the property (not shared by pigments other than lead) of entering into chemical combination with linseed oil, forming when dry a lead soap (lead linoleate) of great toughness and durability.

Lead pigments are well known

of grinding (Figs 2 and 2A), spreading or covering capacity, etc, will be considered later

The Medium or *Vehicle* is the oil (or mixture of oil and resin) which, before application, holds the fine particles of pigment evenly suspended and after application, forms a tough, adhesive solid, binding the particles firmly to the surface painted The proportion (and quality) of oil used is of far greater importance than the pigment in deciding the character and life of a paint

Linseed and other vegetable drying-oils absorb and combine with oxygen from the air, a process popularly known as drying, but which is a chemical as well as a physical change resulting in the formation (by oxidation) of a glossy, protective film sufficiently elastic to permit some expansion and contraction without cracking or otherwise breaking down Therefore, up to a point, any increase in the oil content of a paint will be accompanied by a corresponding increase in gloss, elasticity, and weather-resisting properties, qualities which are greatly improved when the oil has been previously thickened, either by cooking or by the addition of resin

Drying Agents, known in the trade as "driers," are available in paste, liquid, and powder form Any one of these, when mixed with linseed or other drying oil, accelerates oxidation to such an extent that oil (or oil paint) can be made to dry overnight It should however, be clearly understood that whilst the action of a drier is most vigorous during the twelve hours following the application of a paint, it continues (unless air is excluded by a later coat) to have a hardening effect upon the oil, diminishing as the paint ages but still remaining slightly active until the paint film completely loses its elasticity and begins to break down

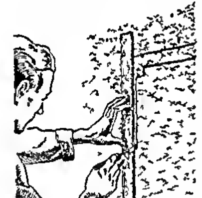


Fig 1 First-class opacity is particularly essential when lining or for any other work of a decorative nature which is to be finished in one coat.

Disadvantages of Driers

The obvious conclusions arising from these facts are that the smaller the amount consistent with commercial requirements, of driers used, the longer will be the life of a paint and that an excess of driers not only reduces gloss and elasticity but speedily results in a hard brittle coating of little protective value, thereby shortening the life of the paint considerably

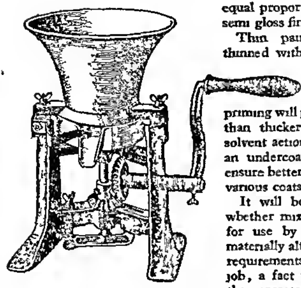


Fig 2. Cone type of grinding mill that is capable of grinding both paste and liquid paints to a very fine degree

The *Thinner* may be regarded as an ingredient which, because of its solvent (thinning) action upon linseed oil, enables paint to be applied more easily and thinly, but which afterwards evaporates completely and, except for a slight residue in the case of turpentine, forms no part of the dry paint film Although it appears to be rather a temporary constituent, it has an important bearing upon the character and use of oil paints

It has previously been stated that the thicker the oil the greater the elasticity and gloss and conversely, if by the addition of turpentine, white spirit or other thinner, the consistency of the oil is reduced, gloss will also be reduced and hardness increased proportionately This fact is exploited almost to the limit in the production of flat paints, which may contain as much as ten parts of thinner to one of the oil medium, when equal proportions are employed, a semi gloss finish results

Thin paint, especially when thinned with turpentine oxidises more rapidly, requires less driers, and when used as a priming will penetrate more deeply than thicker paint The slightly solvent action of the thinner upon an undercoat definitely helps to ensure better cohesion between the various coats

It will be evident that paint, whether mixed or merely thinned for use by the painter, can be materially altered to meet the exact requirements of each particular job, a fact which partly explains the increased popularity, particularly for undercoating, of semi-prepared paints which being of a stiff consistency, allow considerable latitude and control when finally thinning for use

So far, it has been undesirable to do more than generalise rather briefly on the essential ingredients of ordinary paint, but we must now develop a more critical faculty based upon a deeper knowledge of the limitations and peculiarities of the numerous materials, in order to gain the power of discrimination and intelligent selection

Pigments

The pigments, which form the weight and bulk of our paints, vary enormously in many ways Apart from differences in colour and origin, some being natural earths, while others are complex synthetic compounds, there exist wide variations in chemical nature, particle size and shape, degree of porosity, weight, bulk, permanence of colour and structure, drying qualities, opacity, staining strength,

for their good drying properties, for the manner in which they resist humid conditions and exposure to weather without disintegrating, and also for the ease with which surfaces can be prepared when repainting becomes necessary

Disadvantages of Lead

The disadvantages associated with lead are mainly its susceptibility to discoloration in impure air, unless protected by an oil film, and to be affected in the presence of sulphurous compounds or gases This, however, is not detrimental to durability but only affects the decorative value For obvious reasons, flat paint unless protected by varnish, will be more quickly affected than a gloss paint Discoloration will also result from the admixture of any staining (tinting) colour which contains sulphur, colour purity is not equal to that

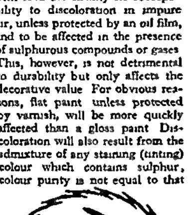


Fig 4 Certification trade mark issued by the Board of Trade signifying that white lead products in connection with which it is used conform to certain special min mum requirements.

of the zinc whites but by adding 20 to 25 per cent of zinc oxide to the lead both colour and durability are improved

White lead in common with other pigments of good opacity, is sometimes adulterated, reduced, or extended, by the addition of barytes or other mineral whites These pigments have little opacity themselves and, therefore, reduce that of the material so extended

Material bought as genuine white lead oil paste, B.S S 241, is guaranteed pure, ready mixed white paint, B S S 261, must contain not more than 4 per cent extender (usually present in the drier), and in coloured lead paint, B S S 262, at least 75 per cent of the pigment must be genuine lead These British Standard Specifications have proved most effective in safeguarding the interests of both purchaser and manufacturer (See also B O T certification, Fig 4)

Other and cheaper forms of white lead are sold as Reduced White Lead No 1, White Lead No 2, etc, and one begins to wonder just what percentage of genuine carbonate of lead one could expect to find in the No 3 quality The heavy and coarse particles of barytes quickly settle out of such paints and constant stirring is very necessary during use Such materials should be limited to priming or undercoats on rough work.

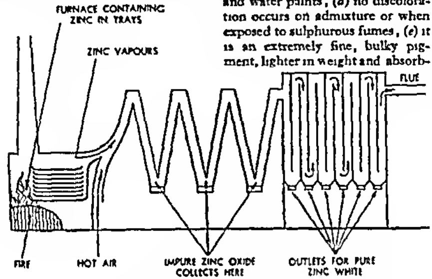
Lead Sulphates (sp gr 6 2) This class includes several varieties of white lead pigments very different from lead carbonate Normal lead sulphate is coarse crystalline, and of poor opacity and colour, its function is, therefore, limited to that of an extending agent.

Basic Lead Sulphate, of which *Sublimed White Lead* is a good example is obtained by smelting the natural lead ore to produce a combination of approximately 80 per cent sulphate 15 per cent

oxide, and 5 per cent zinc oxide The simple, direct method of manufacture enables the pigment to be marketed at a price comparing very favourably with lead carbonate which, if produced by corroding the metallic lead (as in the stack and chamber methods), requires considerably more time In matters of permanence, opacity, colour, and durability, it is claimed to be quite equal if not superior to lead carbonate Being unaffected by admixture or by sulphur, and of a fine amorphous (porous) nature, it makes a smooth oil paint In exposed positions it is better able to resist the slight acidity of rainwater than genuine white lead, its spreading capacity is about equal, but its drying properties will be found to be inferior

Freemans Non poisonous White is another well known compound of basic lead sulphate plus zinc oxide

Zinc Oxide (Fig 5) (sp gr 5 6) The properties associated with the best zinc oxide are (*a*) remarkable whiteness, (*b*) non-poisonous nature, (*c*) permanence in both oil and water paints, (*d*) no discoloration occurs on admixture or when exposed to sulphurous fumes, (*e*) it is an extremely fine, bulky pigment, lighter in weight and absorbing more oil than stack lead consequently its greater volume per cwt increases the spreading capacity by some 50 per cent.



HOW ZINC OXIDE IS MANUFACTURED

Fig 5 Principle of the apparatus employed in the production of zinc oxide

The factors which, to some extent, limit its use are concerned with opacity (it is inferior to white lead), its peculiar hardening action upon the various drying oils, an advantage in hot climates but a feature liable to cause brittleness and short lived durability in our own climate The corrective measures employed for exterior paints include the addition of 40 per cent lead carbonate, or the mixing of pigment with a thicker and more elastic oil such as pale boiled oil or, even better, stand oil, with very little turpentine and the minimum amount of some pale liquid oil drier of the linoleate type (see section on driers) For interior work, zinc oxide is an ideal base

for flat paints or enamels and as a final undercoat prior to white enamel In a water medium it has excellent opacity and is known as *Chinese White*

Lithopone (sp gr 4 3) This pigment is a combination prepared by precipitation of approximately 70 per cent barium sulphate and 30 per cent zinc sulphide Its lack of structural stability when exposed to outdoor conditions limits its usefulness in that sphere, but for general use upon interiors, it is probably the most widely used of all white pigments

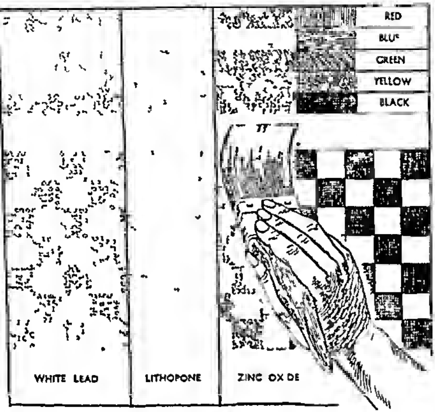
Good Features

Apart from its limitations as a sulphide pigment and, therefore, its liability to discolour any lead or copper compounds which are admixed, it has the following good features (1) It is comparatively cheap and non poisonous, (2) in opacity (Fig 6), purity of colour, and fineness, it equals the best white lead, (3) its spreading capacity is almost 25 per cent greater than that of zinc oxide, (4) it is equally permanent in oil and water paints, (5) being a sulphide it is not discoloured by fumes but inferior grades are liable to darken upon exposure to bright light, a temporary fault which usually rectifies itself overnight *Lithopone* is equally suitable for both flat and glossy paints can be used in filling-up compositions and is a common ingredient in enamel paints and oil-bound distempers

Titanium Oxide (sp gr 4 1) Of all the white pigments none is equal in opacity and all round qualities to this most recent addition. It appears to possess the combined advantages of the other whites without their limitations Owing to its chemical inertness it cannot form so intimate a combination with linseed oil as does lead carbonate, but when mixed with suitable proportions of stand or other polymerised (partly oxidised) oil, and a small amount of resin, it is claimed to have greater durability than lead In common with other whites, it is improved by the addition of 20 per cent zinc oxide which helps to prevent, or at least delay, the tendency of the paint to chalk.

Titanium white is more expensive per cwt than zinc oxide, but its extraordinary spreading power and remarkable opacity result in a reasonable cost per square yard of surface coated For these reasons it is both unnecessary and unusual to use the pigment at full strength, various grades of the reduced pigment are available to meet the demands of purchasers

All things considered, this material is of more value when used to improve the colour, hiding capacity and, incidentally, the spreading power of the various lead and zinc whites It is claimed that the addition of 4 per cent to stack lead increases spreading capacity by 25 per cent, at an increase in cost of only 2 per cent This means, in effect, that pigments of poor opacity, such as barytes, can, by the addition of about 20 per cent titanium be transformed into cheap, useful material By its use in high grade enamels, which formerly contained zinc oxide only, the smaller percentage of pigment required in proportion to the varnish medium, has effected improvements in gloss flow, and durability In stoving enamels, cellulose enamels, water paints and spraying paints it is equally useful



TESTING FOR OPACITY

Fig 6. White pigments being tested side by side upon a background which is partly chequered in black and cream and partly coated with bands of colour

Antimony White (sp gr 5 5) Since its introduction under the proprietary name of *Timonox* in 1919 this fine crystalline pigment which ranks second to titanium white in opacity and colour has justified inclusion in the short list of important white pigments Like titanium oxide it is non poisonous inert towards linseed oil has good brushing qualities and a weather-resisting capacity equal to white lead There is a tendency for some slight discoloration to occur when it is exposed to sulphurous fumes but this is only temporary as the original whiteness returns in the presence of pure air and daylight

On exterior work, paints made from antimony oxide require 10 per cent zinc oxide and up to 20 per cent artificial barytes to correct the structural softness of the material this to be thinned to a brushing consistency with pale boiled oil and a little turpentine A pale drier of the liquid oil type is recommended

Mineral Whites This group comprises those pigments which mainly because of their cheapness, are often admixed with more expensive materials Although this practice, if carried to excess would constitute flagrant adulteration the judicious and scientifically controlled use of these extenders

actually improves the durability and brushing qualities of certain paints Tests prove that practically indestructible substances such as barytes, asbestine, silica, china clay, and other crystalline pigments, are capable of reinforcing and giving structural strength and stability to softer and finer pigments such as titanium and antimony whites On the other hand, alumina, talc, and the finer grades of china clay, act as supporting agents and, by their lightness and smoothness, assist in promoting flow and free working properties with bulky materials such as zinc oxide

All these extenders have little or no opacity when used in oil paint, so the rule governing their use must always be just sufficient to fulfil a definite and necessary function, but not more When used in water paints, the majority of mineral whites are quite opaque and are thus of particular value in that medium

Natural Barytes (sp gr 4 5) Judging by the amount used, barytes, the heaviest and best known of the mineral whites, would appear to be a close rival to lithopone and white lead It is, in fact, available as a paste pigment (probably improved by titanium or other white) under the name of *Permanent White*, a title which aptly sums up its properties Neither concentrated acids nor alkalis have the slightest effect upon its colour or structure and its inertness makes it safe and harmless in any mixture Of the two qualities obtained from the crude spar, even the finer and more opaque grade feels coarse and gritty to the touch.

It is highly probable that, if used alone in paint for exterior work, the coarse, sharp particles would as a result of movement due to climatic changes, cut through the surface of the film and thus accelerate its breakdown This indicates that barytes, to be of use on exteriors, would require a sufficient amount of some finer pigment to fill up the voids in the paint film and thus exercise some control over movement Colours such as Brunswick green, Brunswick blue, the chromes, lakes, and paste driers are usually reduced with barytes, and as its opacity is better in water than in oil, this mineral white forms a useful ingredient of oil-bound distempers

Blanc Fixe, or artificial barytes, is prepared chemically by precipitation, but being identical with the natural variety in composition, and possessing all the good features of the latter plus a fine amorphous structure, it is infinitely superior in every way Unfortunately, its opacity in oil is not greatly improved, and its cost being already increased by the method of production, it cannot after rectification with titanium be classed as one of the cheap mineral whites either in price or performance, but rather as a moderate and quite reliable material for general purposes indoors In spite of its weight, it makes a good supporting agent and an excellent lake base for paints and enamels

Strontium Sulphate is found naturally as the mineral celestine The supply is very limited, and the pigment, which is lighter, softer, and more absorbent than natural barytes, has the same general properties and uses

Whiting, Paris White or Spanish White (sp gr 2 5) Occurring naturally as chalk, which only

needs to be quarried, ground, washed, and dried, this fine amorphous pigment is almost pure carbonate of calcium When used as a body colour in water, its opacity and reflective powers are very great, hence its general use as the base of all distempers Its use in oil is strictly limited by its exceptionally poor opacity and slightly alkaline nature, but as the solid basis of linseed oil putty, and as an extender or filler for paste driers, it continues to occupy a permanent place in painting

From time to time it is used to reduce other pigments but, owing to its porosity, it tends to reduce gloss, and if employed as an ingredient in the final undercoat prior to varnishing, it is extremely likely that the brilliance of the varnish would be short-lived This fact should be remembered when using paste driers (materials containing approximately 30 per cent of whiting) If, during its preparation, the material is overheated, some particles revert back to calcium oxide (quick-lime), a most undesirable substance as far as oil paint is concerned, but one which is of little consequence in distempers

China Clay or Kaolin (sp gr 2 2) When prepared for use as a pigment, china clay is a pure form of aluminium silicate, one of the lightest and finest of mineral whites In permanence of structure and other qualities, it is quite equal to blanc fixe and has identically the same uses Its greater bulk does in some cases make it more valuable as a supporting agent Kaolin is more expensive to produce, and its opacity in water is no better than whiting or gypsum, so its use is limited to that of an extender, a base for lakes, and an ingredient in ultramarine blue

Talc, Magnesium Silicate or French Chalk, also has a limited use as an ingredient in paints and lakes. When ground in oil it is almost transparent, otherwise its properties are similar to china clay

Silica (sp gr 2 5) occurs in several forms, first, as infusorial earth of a fine amorphous variety, secondly, as ground flint (a coarser grade), and, thirdly, in the crystalline form as quartz, sand, etc Its properties and uses are similar to natural barytes for which it is often used as a substitute.

Asbestine is simply the mineral asbestos, crushed and ground to a fine state of division Its composition is mainly silica, with lesser quantities of magnesia, lime, and aluminium, all of which are light in weight and permanent in structure In common with silica and other crystalline pigments it is used chiefly as an extender to give tooth or sharpness to the amorphous pigments, thus improving their grip upon the surface coated The finer varieties are often used in flat paints and where the medium alone is insufficient to support the opaque base during the drying period

Gypsum (natural calcium sulphate) (sp gr 2 3) This is the basis of *Plaster of Paris*, but when of good colour is sold under the names of *Mineral White* and *Terra Alba* In an oil medium, its properties and uses are identical with barytes, in addition, it has some value as an ingredient in the preparation of artificial Venetian red, ultramarine blue, and chrome yellow As a water paint, it is superior in colour and opacity to barytes and is equally reasonable

in price; factors which have ensured its wide use as a base for oil-bound distemper

Another calcium pigment of still better colour and texture is largely used in paper making and staining under the name of *Satin White*, there is, however, no objection to its use in distemper

Alumina or Aluminium Hydroxide is a soft granular white with practically no opacity in oil or water Consequently, it is particularly valuable as a base for translucent lakes (Fig 7) Alumina has the peculiar effect of mixing with oil to form a smooth semi gelatinous mass capable of serving either as a suspending agent, or to impart greater freedom of working i.e improve the brushing qualities of coarser materials and, incidentally, increase spreading capacity

Classification of Oils

Oils may be classified simply as (*a*) fixed, and (*b*) volatile, i.e those which evaporate without the application of heat. The fixed oils include mineral, vegetable, and animal products and for our present purpose are best arranged as three groups, namely (1) Drying oils, chief of which are linseed, tung, etc., (2) semi-drying oils such as cottonseed, hempseed, and soya bean oil, (3) non-drying oils including vegetable and mineral oils Clearly, Group 3 is quite useless as an ingredient in straight oil paints although as a plasticiser in cellulose paints, a small proportion of castor oil is frequently employed Group No 2 has but a limited use in the grinding of paste colours which remain in good condition for a longer period and apparently dry quite normally when reduced in the ordinary way with linseed oil and driers Group 1 alone concerns the painter, and of this, linseed oil, mainly because of its superior drying properties, moderate price, and extensive production, ranks first in importance Tung oil is a unique and equally valuable product from the varnish manufacturer's point of view, but because of the limited supply it has not as yet become available to the painting trade in general

Linseed Oil is obtained from the seeds of the flax plant, universally grown throughout the world. Climatic conditions, methods of cultivation etc., affect the quality and quantity of oil produced from the seed of various countries but it is generally agreed that the following arrangement gives the correct order of merit (1) Russian, Baltic zone, (2) Russian, Black Sea zone, (3) American, (4) Indian, consequently, the oils are described as Baltic oil, American, etc., denoting the origin and the quality of the product.

The crude drying oils are a complex union of various fatty acids and glycerine, albumen, mucilage, water, and colouring matter, but only the glycerides of the oil acids are of value in paint. To obtain this group and eliminate albumen, etc., the following process is now in general use The seeds are crushed, heated to solidify the albumen and render the oil more fluid, pressed for half an hour at from one to two tons per square inch and, finally, to purify the oil so obtained, some simple refining method is employed.

One process, which purifies the oil in a perfectly natural manner, consists of storing the crude material in tanks and maintaining a temperature of about 160 deg F.,

which helps to coagulate and precipitate the solid matter and other impurities, the clear oil, being lighter in weight, can then be siphoned off Time is an important factor in natural refining because the oil becomes paler and the quality is improved by age, unfortunately, cost also is increased The product is, however, in great demand for varnish making

Linseed Oil

Much of the linseed oil produced nowadays is refined by a process calculated to increase output and save time The crude or raw oil is heated as before and, when moderately clear, is treated with 3 per cent sulphuric acid with the object of dissolving any impurities still remaining in suspension After twenty-four hours the acid and other sediment is drained off, warm water is stirred in to wash out any trace of acid and, when this settles, the oil is left clear and ready for use

It will be found that further sediment often appears after storing for some time in the paint shop This is known as linseed oil 'foots,' and is quite useless in paints although it is often used by manufacturers in the making of putty Some confusion appears to prevail in the painting trade as to the proper name for this refined oil, it should be obvious that raw (crude) oil is never supplied to the trade but only the "refined," and the 'boiled oils

Use of Refined Oil

The essential properties of this medium have been enumerated previously, nevertheless certain conclusions arising from many years of experience indicate that

Fig 7. Translucent pigments are largely used in broken-colour work In this instance an attractive pattern is in the process of being produced by rag rolling upon the wet paint

for best results either on interior or exterior work, for dark or pale colours, refined oil is more reliable than boiled oil Exceptions occur in the case of titanium, zinc oxide, and antimony whites for which pale boiled oil was recommended, but if the viscosity (thickness) of refined oil is improved by a percentage of stand oil, or good elastic varnish, the paint will spread more easily and keep a better colour These qualities are, in fact, strong points in favour of refined oil, its easy working property and its action of bleaching or becoming paler in the presence of daylight, coupled with its stability and toughness, make it preferable to the ordinary boiled oil which already dark in colour, darkens still more with age and, by its thicker consistency, tends to blister more readily under heat Pale boiled oils represent the intermediate quality and thus

appear to be superior for finishing coats upon exterior work

Linseed oil is sometimes adulterated with hempseed, cottonseed, or whale oils, all of which are inferior in drying qualities, such additions have to be very small to escape notice In the first place, drying is affected, the smell is slightly different to the characteristic odour of crushed linseed meal, and the weight is rather less than the 9 lb 6 oz which is the standard weight per gallon of genuine linseed oil

Boiled Linseed Oil The objects of "boiling" or "cooking" linseed oil are twofold, firstly, it is well known that prolonged heating partly decomposes and partly polymerises (thickens) the oil, thus improving gloss and elasticity, secondly, as polymerisation is normally an important stage in the drying of the oil, this cooking materially hastens the final drying action, even without the addition of drying agents (Fig 8)

Boiled Oil

During the past few years there have been definite signs of a change of attitude against the older type of boiled oil which, being dark in colour (due partly to red lead or manganese drying agants and partly to the high cooking temperature), has a more limited use than the paler varieties which involve cooking for a longer period at a lower temperature, and which also utilise paler and more easily soluble driers The older method of boiling at 500 deg F over a fire is more difficult to control and, if overheated, the oil is liable to be cloudy, ropy (similar in appearance to coarse brushwork), and of inferior quality. Up-to-date plants make use of boilers with steam-heated jackets, for only by such a method can real control be exercised

Various new processes have been devised to improve the flow, drying properties, body, and toughness of linseed oil Paler mediums of various degrees of viscosity are now in use under such names as stand oil, blown or oxidised oil, polymerised oil, vigorised oil, etc. All are partly polymerised by cooking, the blown and vigorised oils are subjected to the action of oxygen, some of which combines with the oil and so assists drying A further development of this process makes use of ultra-violet light to bleach the oil and, at the same time, exercise a stimulating effect upon the drying action It is claimed that treatment by the actinic rays of light causes the oil to dry rapidly and consistently throughout the whole thickness of the film. It is rather significant that these oils are also being largely used in the preparation of rubber and other hardwearing synthetic paints

Substitutes for boiled oil are usually mixtures of the genuine article with either rosin oil, rosin and white spirit, or one of the inferior vegetable or fish oils There have, however, been cases where rosin dissolved in white spirit has been sold as boiled oil. Such material would no doubt shine for a few weeks before reverting to its original brittleness and then cracking and breaking down

Tests for Oils

The tests usually employed for the identification of oils and solvents comprise, specific gravity, flash point, refractive index, and others, outside the scope of the

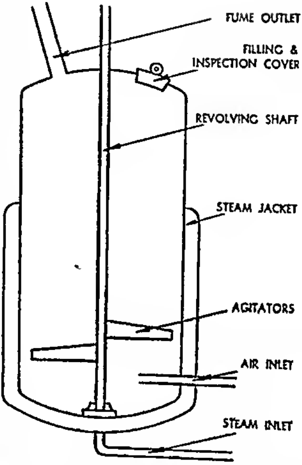


Fig 8. Oil cooking plant used in the "boiling" of linseed oil by which process its gloss and elasticity is improved and its final drying action accelerated

painter The necessity for an expert test will speedily be indicated by the general behaviour and drying qualities of the material in question, any adulteration will manifest itself by some peculiarity during or soon after application

Tung Oil is a comparatively recent addition still in the early stages of development. As yet, the limited and erratic supply is the monopoly of varnish manufacturers who have by its use already effected revolutionary changes regarded as impossible a few years ago By its combination with rosin (formerly the most despised of all gums) a new and valuable range of varnish resins, quite equal to the copals, has been evolved Its resistance to water, and its natural drying properties, are exceptional, but its peculiarities demand new and expert technique It cannot for example be heated or cooked to the same extent as linseed oil without polymerising and becoming permanently solid A similar effect is slowly brought about by exposure to bright light the substance in this case being slightly opaque

Compared with linseed oil it has higher viscosity, greater gloss, better resistance to moisture, and one real drawback, the tendency of the film to dry with a crinkly surface In modern crackle finishes, this fault is deliberately exploited, but in normal gloss paints considerable skill and experience are necessary to overcome the defect

Tung oil, in combination with ester gum forms the basis of the so-called four-hour enamels which have the property of setting in two to four hours and oxidising later The use of wood oil in water paints, alkali-resisting paints, flat

enamels, etc, is an indication of its growing popularity.

Chlorinated Rubber. The elastic nature of rubber requires no emphasis here, but when that property plus an extremely high resistance to water, alkalis, and acids (except acetic) is further supplemented by outstanding adhesive, quick-drying, and easy brushing qualities, one must credit the chemist with yet another remarkable achievement Chlorinated rubber forms a transparent medium rather lacking in gloss, but the deficiency is not difficult to make good, considering the ease with which it mixes (when heated) with resin and most of the drying oils It is available in several degrees of viscosity, is non-poisonous, non-inflammable, soluble in cheap solvents, and withstands a baking or stoving temperature of 250 deg F.

Rubber Paint Experiments

The writer has tested its efficiency as an adhesive for the fixing of Lincrusta, and found it superior to dextrine paste Other experiments with several types of high gloss rubber paints show that, apart from a slight slowing down in the drying action, no injurious effects are apparent as a result of tinting with colours ground in oil, or when thinned with white spirit or turpentine This however, is not meant to imply that all such paints would respond in the same manner In these days of steel and concrete construction rubber, on account of its unsaponifiable nature, may soon solve the problem of painting upon Portland and other alkaline cements

Solvents and Thinners The functions of an ordinary solvent or thinner have so far been considered in relation to oil paint only We have seen that a solvent, by dissolving and thereby thinning out the oil medium (or combination of oil and resin), causes paint to spread more easily, dry more quickly, and produce a harder paint film Turpentine, white spirit, and shale naphtha or naphtha are mostly used for the purpose, the more powerful materials being utilised chiefly by manufacturers

For Anti fouling Paints

Coal tar or solvent naphtha is rarely used except in priming paints, where its powers of deeper penetration, and sterilising action upon fungoid spores, makes it particularly valuable for anti-fouling paints generally, and, in varnish making, for those resins insoluble in the milder type of turpentine and white spirit In view of the fact that solvent naphtha is strong enough to form an ingredient of many paint removers, its general use in oil paint, particularly in the final coat, would be a risky procedure

The first essential of a thinner, apart from its action upon the oil, is that it must have just sufficient strength to bite into and get a good grip upon the surface of the dry paint beneath without softening it. Secondly, it should be sufficiently volatile to evaporate quickly and yet give ample time for crossing and laying off during the process of application If the thinner were to evaporate too quickly, the flowing qualities of a paint would be injured, leaving brushmarks too much in evidence Thirdly, evaporation must be complete, leaving no greasy residue to sweat out later and cause a bloom on the surface The presence of non-

drying mineral oil would also have a bad effect upon the oxidation of the oil medium

These are the three essential properties of a thinner, but the following conditions have also an important bearing upon the subject (*a*) the liquid should be chemically neutral, *i e* quite free from traces of acid or alkaline substances This degree of purity is not found in carelessly prepared substitutes; (*b*) it must be non-toxie, otherwise poisonous fumes would be liberated during the drying period, an exhaust-pipe with fan-wheel could scarcely be carried about from job to job, (*c*) the inflammability of ordinary solvents involves some fire risk (Fig 9) and it is well to remember that, nowadays, non-inflammable solvents of the carbon tetrachloride type are available for special purposes, (*d*) colour and smell should be normal, a cloudy or coloured sample suggests the presence of impurities, and the pungent odour associated with some varieties of resin spirit, and wood turpentine, are far from pleasant

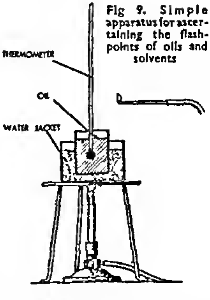


Fig 9. Simple apparatus for ascertaining the flash-points of oils and solvents

Turpentine is the name formerly given to the crude resin or sap from coniferous pine trees, the spirit or oil of turpentine (which concerns the painter) is obtained by distilling the crude resin at a temperature of 275 to 340 deg F, until all the highly volatile spirit is extracted and only the residue *Rosin* remains in the still Both the original resin (known as Gum Thus) and rosin are largely used in varnish making

Wood Turpentine Until recently, the indiscriminate tapping of pine trees, without proper measures being taken for their replacement, has seriously decreased the production of genuine turpentine It was, however, discovered that every part of the tree, including the roots, would, if destructively distilled, yield a worth-while quantity of spirit practically equal in its properties to the genuine article This procedure has now been universally adopted and will undoubtedly continue to make a valuable contribution to the painting trade

Blended Turpentine The several varieties of turpentine are known respectively as American, Russian, Canadian (thus denoting the country of origin), and, lastly, blended turpentine The latter can be expected to consist of pure turpentine, plus wood turpentine, or rosin spirit, all of which are undoubtedly products from a common source Therefore, the name is held to be justifiable and the material is usually accepted as being equal in all respects to the product termed "genuine" There is, of course, nothing to prevent a proportion of white spirit, or shale

naphtha from being included or blended into the mixture, and such adulteration would be disguised by the characteristic smell of the genuine material It could not in that case, truthfully justify the name

Rosin Spirit Following the extraction of turpentine (all of which is distilled below 350 deg F), about 80 per cent of the original gum is left behind as rosin (Fig 10) From this, a further 15 per cent of volatile spirit (rosin spirit) is obtainable by the simple process of gradually increasing the temperature to 420 deg F Superheated steam is employed to force out the maximum yield, but if too much heat is applied, a proportion of non-drying oil (rosin oil) will also be extracted with the remainder

Turpentine Substitute

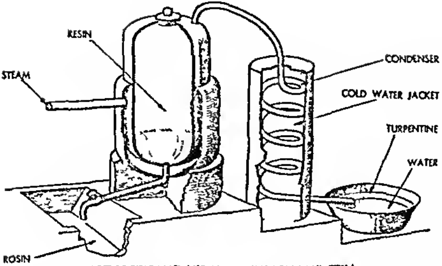
Rosin spirit is a substitute for turpentine, its properties being only slightly inferior In the first place there is always the danger of contamination with rosin oil, secondly, the smell is unpleasantly strong a factor likely to annoy some clients, but attempts are now made to correct this fault by treatment with camphor

Shale Naphtha Shale spirit, or naphtha is a common substitute for turpentine and when properly prepared, is a fairly reliable material As a solvent, it behaves in much the same manner as turpentine, dissolving all the drying oils and many of the resins It is of course, much cheaper, and when used in ready mixed paints is less liable to undergo chemical change such as sometimes occurs when genuine turpentine is employed Along with white spirit (which is equally neutral) it is particularly valuable to manufacturers of paints and varnishes, who have found that the peculiar action of gumming or livering (whereby the paint becomes semi-solid) which sometimes occurred when certain pigments were mixed with turpentine, is less liable to result from the use of mineral solvents

White (Petroleum) Spirit, also known as *Naphtha*, *Benzine*, and *Benzoline* This product is only slightly different from shale spirit Both are distilled from crude mineral oil, but where shale oil and Russian mineral oil are about equal (yielding 5 per cent naphtha), the American product is richer in highly volatile paraffin matter, giving as much as 25 per cent naphtha By distilling at various temperatures (fractional distillation), light, medium, and heavy grades, known respectively as benzine or benzoline, naphtha, and gasoline are obtained Paraffin or illuminating oils are extracted at a higher temperature, leaving the fixed oils behind for further treatment

Solvent Naphtha or Coal-Tar Naphtha Its name clearly denotes the origin of this the most powerful of the straight mineral solvents When coal tar is subjected to the same treatment as mineral oil, *i.e* to fractional distillation about 5 per cent of crude naphtha and certain heavier oils are obtained The naphtha is refined and again distilled to extract (*a*) benzol and benzene the lightest products (obtained below 280 deg F), and, (*b*) solvent naphtha, extracted up to 350 deg F

Although too powerful for ordinary types of paint finishes its germicidal properties and its greater



PART-SECTIONED VIEW OF TURPENTINE STILL

Fig 10 After the turpentine has been taken away from the resin, about 80 per cent of the gum remains as rosin, from which 15 per cent of rosin spirit is got.

solvent action upon the various resins make it particularly suitable as an ingredient *in oil stains*, varnishes, priming paints (especially upon resinous timber), and also in paint removers

Table I gives the various figures which serve to identify the several products

TABLE I

	Sp gr	Flash point deg F	Distilling temperature deg F
Turpentine	0·862–0·872	93 105	310–350
Rosin spirit	0·876–0·883	97–102	250–440
Shale spirit	0·730–0·760	60–70	170–375
White spirit	0·730–0·760	60–70	150–300
Coal tar naphtha	0·865–0·877	120	230–400
Methylated spirit	0·821	57–60	below 212

Tetralin and *Dekalin* are comparatively new solvents prepared from naphthaline and hydrogen. They evaporate much more slowly than ordinary solvents and, like turpentine, *are partly oxidised* during the process of drying These features are sometimes utilised to correct the more highly volatile white spirit, and it is claimed that, suitably blended, a mixture possessing all the properties of genuine turpentine is produced These new solvents are much too powerful to be used at full strength, indeed, tetralin will dissolve linoxyn and, *when mixed with acetone, an* effective paint remover is obtained In common with other coal-tar products, they are efficient solvents of oils, resins, waxes, and rubber

Ethylene Chloride and *Methylene Chloride* are but two of the recently developed solvents prepared from acetylene and chlorine Like tetralin they are capable paint removers, a feature which prohibits their use as paint thinners, but as they are highly volatile and practically non-inflammable, they are frequently mixed with other solvents so as to

reduce the inflammability of spirit varnishes and cellulose lacquers, and also in the preparation of quick-drying spray paints

Wood Alcohol, Wood Spirit, or Wood Naphtha These are names given to the impure form of methyl alcohol obtained by the destructive distillation of seasoned hardwoods such as elm, beech, birch, and oak. It has properties very similar to ethyl alcohol and, on account of its poisonous nature and cheapness, it is regularly used to adulterate and denature (render undrinkable) the more costly ethyl alcohol It is a good solvent for shellac and many of the softer resins, thus acting as both thinner and medium in the production of spirit varnishes, French polish, patent knotting etc When combined with a small amount of acetone (forming methyl acetone) its solvent action is considerably increased, rendering it suitable for use with cellulose nitrate, cellulose acetate, rosin, and the softer Bakelite (synthetic) resins

Ethyl Alcohol is perhaps better known as methylated spirit, methylated finish, industrial alcohol, rectified spirit, or spirit of wine It is a product of the fermentation of starch and sugar, and is manufactured on a large scale by distilling the fermented liquor from corn, barley, and other cereals

Methylated Spirit contains 80 per cent of the pure spirit made undrinkable by the admixture of mineral naphtha, or wood naphtha, and methyl violet which imparts the characteristic mauve tint

Industrial Alcohol contains 88 per cent alcohol but is not denatured by other substances to the same extent as meth It is not sold by retailers, but only under licence for manufacturing purposes where a greater degree of purity is required

Methylated Finish generally has a higher alcohol content than methylated spirit and, being denatured by the addition of rosin (3 oz to the gallon), it can be sold without a licence For use in the painting trade, rosin is not in any way detrimental and it is, therefore, preferable to methylated spirit

Rectified Spirit of Wine is the most concentrated of the common alcohols and is prepared by redistilling the ordinary product, thus ensuring greater purity In French polishing it is infinitely more valuable than any of the foregoing varieties The ethyl alcohols have no solvent action upon linseed oil and, on that account, are not used in ordinary paint; they are, however, widely employed in all types of spirit varnish, spirit stains, lacquers and, to some extent, in paint removers

Butyl Alcohol (*Butanol*) This powerful and extremely important solvent is now manufactured in large quantities from maize flour, and also from acetylene It has many valuable features, chief of which are its unique property of dissolving synthetic resins, hard resins such as copal, kauri, shellac, and also the various metallic resinates used as driers Its ability to mix well with oils, alcohols, and petroleum solvents enables liquids such as white spirit and alcohol to form a perfectly homogeneous mixture

Butyl Acetate (butanol combined with an organic acid) The discovery of this ester solvent may be regarded as marking the commencement of the large-scale manufacture of cellulose lacquers Until quite recently, industry had

to depend mainly upon amyl acetate, a product variable in quality but too limited in quantity to satisfy the increasing demand The newer product, having practically the same properties plus the advantages of cheapness, adequacy of supply, and greater uniformity of composition, has now to a large extent superseded amyl acetate as a cellulose ingredient

Other well-known solvents of the same class are *Methyl* and *Ethyl Acetates*, all having to some extent the characteristic "peardrop" smell and all being powerful solvents of nitrate cellulose Butyl acetate is not particularly effective with natural resins but is widely employed as a solvent for the phenol-formaldehyde type of synthetic resin

Acetone Although by no means a new product, acetone is one of the most powerful solvents known It is produced on a large scale (in conjunction with butanol) by the fermentation of maize flour, the crude distillate containing approximately 30 per cent acetone, 60 per cent butanol, and 10 per cent alcohol Unlike the acetates, it is highly volatile and very inflammable nevertheless its excellent all round mixing qualities, combined with great solvent power, have made it indispensable (and equal in importance to butyl acetate) as an ingredient in cellulose lacquers

Dangerously Poisonous Solvents Fortunately, the ordinary solvents used by painters do not vaporise rapidly enough to form high concentrations and are therefore regarded as comparatively harmless in their effects, at the same time, ample ventilation should always be provided, particularly when spray painting, if one is to avoid the mildly narcotic effects which may result from long exposure to fumes

Driers When the apprentice comes along with the query, "What are driers, and how do they work?" even the oldest chargehand is apt to evade the challenge That same question has been, and still is, the subject of much controversy and research Practical experience provides the answer to the first query, for one quickly discovers that certain pigments, particularly those rich in the oxides of the metals, lead or manganese, are outstanding in their drying effect upon linseed oil

The materials used in the manufacture of driers are lead acetate, litharge (monoxide of lead), red lead (basic oxide of lead) dioxide of manganese, manganese sulphate, and oxide of cobalt An idea of their effectiveness may be gathered from the quantities necessary for treating 1 gal of linseed oil, these vary between 1 oz in the case of lead acetate, to ½ oz in the case of manganese The drying agent must in each instance be completely dissolved in the hot oil

These materials are much too powerful to use at full strength, hence the reduced forms known to us respectively as paste driers, terebine, liquid oil driers powder driers, japanner s gold size, and, lastly, boiled oil By using a weaker and more convenient form of drier, there is less danger of adding an excessive amount and thus injuring the paint

Paste, or Patent Driers may be expected to contain approximately 10 per cent lead acetate, reduced with 45 per cent barytes, 30 per cent whiting, and 15 per cent linseed oil In colour it is almost white,

and is thus suitable for use in both undercoats and pale finishes where a flat or semi-flat surface is required As has already been mentioned, its whiting content has a damaging effect upon gloss, a feature which makes it unsatisfactory as an ingredient in high-gloss finishes Its lack of opacity must also be remembered, as it is bound to have the same effect as any other extender in reducing the opacity of a paint proportionately to the amount used In a drier of average quality, 1 oz to 1 lb of pigment is sufficient

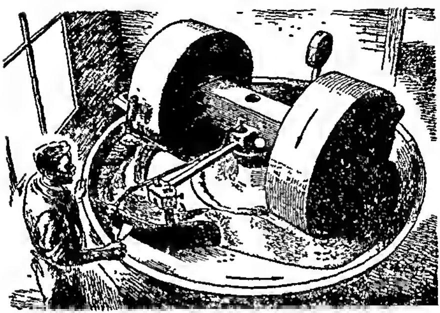
Zinc Powder Driers A composition typical of this class would contain one part of driers (consisting of equal parts manganese sulphate, manganese acetate, and zinc sulphate) reduced with fifty parts of zinc oxide It is prepared exclusively for use in white finishes, particularly zinc whites, but it must be remembered that dry powder will not mix with paint unless previously well mixed (separately) with oil or turpentine Powder driers are, of course, very opaque and are not, like lead acetate, liable to slight discoloration when exposed to fumes

Terebine or Liquid Driers are usually dark in colour and, owing to the high proportion of turpentine or white spirit, of a rather thin consistency As a class they are the most powerful driers available, but they vary both in strength and colour according to the basic substance employed Cooked oils, for example, even when treated to saturation point with red lead and manganese dioxide, are only capable of absorbing a limited amount which naturally limits their strength as liquid drying agents The easily soluble lead, manganese, and cobalt borates, resinates, etc , being unrestricted in this respect, are able to mix with the thinner to produce a highly concentrated drier, hence the wisdom of carefully testing the material before using it on a large scale

Liquid Oil Driers For all-round excellence this type appears to merit first place Its composition ensures some standardisation between the various makes and, at the same time, imparts the quality of elasticity which is entirely absent in all the foregoing driers It differs from terebine in the following respects (*a*) the predominating medium is linseed oil, sometimes reinforced with resin, to counteract brittleness and improve gloss, (*b*) pale driers, of the linoleate, borate, or acetate type, which dissolve at low temperatures are used to produce these very pale drying agents, (*c*) as a rule they are not quite so powerful as the terebines, but are strong enough for all practical purposes and, if the primary aim is to produce a drier with the greatest safety margin, the liquid oil type is probably the best.

Coloured Pigments These may be classified according to colour, chemical composition, method of manufacture, properties, etc., each arrangement having particular advantages from a quick reference point of view but, as no single classification embraces all the pros and cons of the subject, it will, perhaps, be advisable to begin by considering the various materials according to colour, and to supplement this by the inclusion of appropriate tables

As the properties and uses of pigments are in every case influenced by their chemical composition and their method of



EDGE-RUNNER MILL

Fig. 11. This edge runner mill forms part of the equipment of all paint manufacturers The pan rotates while the grinding wheels operate on a fixed axle

manufacture, the advisability of making some brief reference to these matters, and thereby assisting better comprehension of the why and wherefore of underlying principles, will at once be apparent It will also be found that this method of approach provides a sound basis for the memorising of salient points

We already know, for instance, that lead and copper pigments are discoloured by sulphur, that sulphides (pigments containing sulphur) are immune from this drawback, and that natural pigments are, as a rule, proof against the injurious effects of sulphur, heat, and alkalis Therefore it follows that alkali-resisting qualities will be found in colours prepared from or containing some form of alkali, and that methods of production involving calcination (roasting), volatilisation, or oxidation by means of heat, will provide colours resistant to heat By arranging and associating our ideas upon these lines, the practical and sensible application of our knowledge can, to a great extent, be simplified

Ochres and Siennas occur as natural earth pigments in various parts of the world They are, chemically speaking, natural oxides of iron more or less hydrated (combined with water) and, in the case of sienna, containing traces of manganese oxide Varying proportions of silica and alumina are also present. The ochres in general use range from light reddish-yellow to dark brownish-yellow and are known as Oxford, French, Spruce, and Italian ochre

The preparation of all natural earth colours consists simply of digging out the coloured earth, grinding to a smooth paste in edge-runner mills (Fig 11), levigating,

to eliminate coarse particles (Fig 12), drying and finally grinding, either in oil, water, or to a fine powder, according to market requirements The application of excessive heat during the drying process has the effect of dehydrating the iron oxide (driving out chemically combined water) and producing a red pigment (see Venetian Red) This procedure of calcining the pigment is followed to produce the rich orange red hue characteristic of burnt sienna

Earth Colours

The earth colours are, with the exception of Vandyke brown, absolutely permanent under all normal conditions, they are safely miscible with all other colours and are not discoloured by lime or other alkaline substances They may be used either in oil paint or distemper, and the ochres, although apparently lacking in purity and brightness, produce, when mixed with white, a surprising range of luminous tints Purity of colour, opacity, and staining strength, decide the market values of the several varieties

Raw Sienna differs from ochre in one important quality, that of opacity Where ochre excels sienna is quite the opposite, translucency being its most valuable property. Its staining strength is naturally inferior to that of ochre, but as a stain, or semi-transparent glaze colour for graining or marbling, it gives entire satisfaction

Chrome Ochre and Golden Ochre are paler and brighter in colour than the normal earth pigment The improvement is effected by adding one of the more brightly hued yellow pigments such as chrome or one of the coal-tar lake pigments, to Oxford ochre until the desired brilliance is obtained Their main purpose is to produce tints of greater purity than would be possible with ochre alone

Chrome Yellow This is the brightest pigment in general use and, being plentiful and moderate in price, has superseded King's Yellow, Naples Yellow, Turner's Yellow, and others of undoubted popularity half a century ago The colours now used include the chromates of lead, barium (barytes), strontium, and zinc, the first named being by far the most important All are precipitates from solutions of bichromate of potash and the appropriate metallic element, a method of production resulting in such extreme fineness as to make levigation unnecessary

Lead Chrome is available as pale (lemon yellow), middle, and deep chrome The metallic element employed is acetate of lead in solution; by varying the proportions and for pale tints, adding Glauber salt, the several distinct tones are obtained The properties of lead chrome are identical with those of lead carbonate, in this case, durability and opacity are supplemented by high staining strength, but its susceptibility to discoloration upon exposure to sulphur or lime renders it unfit for use in distemper

It is, however, quite satisfactory in oil, always providing that it is never used for painting upon actively alkaline surfaces such as lime-plaster and portland cement This pigment is largely used, along with Prussian blue, in the manufacture of Brunswick green

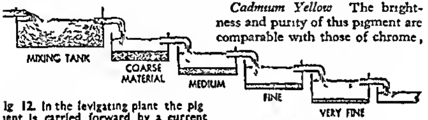
Orange Chrome It has been found that when exposed to the action of heat and alkalis, a basic lead chromate is formed This chemical change can be either

rtly or completely brought ıout; a fact which is fully exoited in the production of orange ıd scarlet chromes When newlyrmed chrome yellow is treated ıth caustic soda and boiled for ɔout an hour, the colour changes ı brilliant orange, but if boiled for longer period, the colour can be ɛveloped until a bright scarlet ɛsults When the pigment settles, ıe free liquid is run off and the ɔlour washed with several changes

oil-bound or size-bound type, it is moderately permanent, but not against the action of fresh limeplaster

Dutch Pink is a lake pigment of a peculiar, pale, dull-yellow colour, and is manufactured specially for use as a distemper pigment When ground in oil it assumes a dark brown shade and becomes translucent—the quality one seeks in glaze colours, it is, however, rarely used in an oil medium

Cadmium Yellow The brightness and purity of this pigment are comparable with those of chrome,



ig 12. In the levigating plant the pig ıent is carried forward by a current l running water and graded into varying degrees of fineness

ıf water before finally allowing the ɔolour to dry

The properties and uses are as ndicated for chrome yellows, exɛept that the oranges and reds, being already saturated with alkaline matter, are not subject to discoloration by active lime and may, therefore, be used more freely

Barium and *Strontium Chromates* are paler and less opaque than the foregoing types, but have the advantages of being non-poisonous and unaffected by sulphurous compounds or lime, on this account, they are equally permanent in oil or water paints

Zinc Chrome is available in several tones, and being unaffected by admixture or by the usual injurious influences, forms a fairly permanent pigment Its main limitation is that it is readily attacked by even dilute acids and it is advisable to reserve it for interior work only As a water paint of the

consequently, it is occasionally used in the more decorative work but being a sulphide of the metal cadmium, it will discolour any lead or copper pigment if inadvertently admixed In other mixtures it is fairly permanent

The Green Pigments The most commonly used green is that known as *Brunswick or Chrome Green*, a mixture of freshly prepared lead chromate and Prussian blue, reduced considerably with barytes It is available as light, middle, and deep Brunswick green for use in oil colour only In this medium it is permanent only so long as the oil is capable of giving protection against sulphurous gases, any discoloration of the chrome would cause the colour to revert to blue, a state frequently observed on outside work In the presence of alkalis, the blue is completely destroyed and the chrome discoloured, thus producing patches

of yellowish brown, a result which is to be expected if work is carelessly prepared, or if the paint is applied upon actively alkaline surfaces The blueing of Brunswick green on exterior work can, to a large extent, be prevented by the admixture of a small amount of the more stable pigment, golden ochre

Zinc Green or Cobalt Green is prepared from zinc oxide and cobalt sulphate, calcined for several hours at red heat The resulting pigment is of a bright pure colour and is absolutely permanent under all normal conditions in both oil and water mediums Another good feature is its harmless nature when mixed with other pigments; the one disadvantage being its relatively high cost as compared with Brunswick green Colours which may be described as zinc greens are manufactured from zinc chromate and Prussian blue, these are inferior to the genuine product

Oxide of Chromium is a pigment produced by several methods, all of which involve the calculation of chemical substances The product is now widely employed and is well known as the most permanent of all the green pigments Its extraordinary resistance to heat alkalis, acids, and sulphur render it safely miscible with all other colours

Viridian (*Guignet's Green*) (not to be confused with verditers or verdigris) is of similar nature to oxide of chromium, although it differs slightly in composition and properties

Terre Verte has been used from the early days of painting, for, being a natural earth pigment, it occurs in various parts of Europe It owes its colour to its large content of silica and iron and, in common with other iron oxides, reverts to red when exposed to the action of heat In colour, it is a dull grey-green of a translucent character, and although permanent under all ordinary conditions, it is used mainly as a glaze colour.

Emerald Green But for its extremely poisonous nature, this distinctive, brightly coloured pigment would still be largely employed in paints Its composition, consisting mainly of copper and arsenic, prohibits its use in distemper In oil paint it is quite permanent, although like all lead and copper pigments it is discoloured by contact with sulphides

Lime Green is the common blue-green pigment supplied in powder form for use in distemper only Two varieties are in general use; one, prepared by calcining china clay, soda, sulphur, and carbon; the other is obtained by dyeing a natural green earth and so producing a lake pigment Both are permanent in water colour but, when mixed in oil, the colour is darkened and opacity reduced

The Blue Pigments Prussian and Chinese Blue These are the standard blues for oil colour use, and are manufactured as precipitates from prussiate of potash and iron sulphate In colour, they are almost too dark for identification purposes but when employed as stainers for white pigments their intense strength and purity is at once appreciated The slightly greenish tendency of these colours makes them valuable ingredients in the production of greens Although the pigment is quite permanent in oil, it is speedily discoloured by alkalis and is unsuitable for use in distemper

Brunswick and Celestial Blues. These are reduced forms of

Prussian blue, specially prepared to meet the demand for a low-priced dark blue pigment of fair opacity and substance The reducing agent (barytes) imparts weather-resisting properties and improves the hue without unduly damaging the tinting qualities; in fact, the reduced strength is often an advantage when mixing delicate tints

Artificial Ultramarine, also known as *New Blue, French Blue, and Permanent Blue* This pigment has replaced the true ultramarine blue, formerly prepared from the mineral lapis-lazuli, which is now extremely scarce and expensive The synthetic product is obtained by the double calcination of sulphur, sodium carbonate, kaolin, and coal, the first stage resulting in crude lime green and the second stage involving the addition of more sulphur, prior to the final roasting which yields blue

Permanent Blue

The name, permanent blue, correctly sums up the properties of the colour both in oil and water mediums Although it lacks resistance to acids, it remains quite unchanged in the presence of caustic soda and is extremely valuable in positions exposed to heat or alkalis Being a sulphide, it must be kept severely apart from lead and copper pigments

Lime Blue As the name implies, this pigment is specially prepared to meet the demand for a cheap, lime-resisting blue for use as a tinting colour in distemper It is only available in powder form, and is practically useless in oil

Monastral Fast Blue is an entirely new pigment possessing all the good qualities without the shortcomings of the older materials It represents the successful conclusion of years of intensive research in the coal-tar dyestuffs industry which, curiously enough, has produced an endless range of yellows, reds, greens, purples, and blacks, of sufficient permanency and opacity for use in paints, but a blue of the right type has remained conspicuously absent

Effect of Light

It is frequently asserted that all colours fade more or less as a result of prolonged exposure to light, especially sunlight, yet, after stringent tests, monastral blue appears to merit first place for all-round resistance to light, alkalis, acids and, to a lesser extent, heat Its brilliant light-blue colour and its harmless nature, render it absolutely safe with all other pigments

Cobalt Blue But for its prohibitive cost, this compound of the oxides of cobalt and alumina would be in great demand by painters and decorators Its excellent colour, absolute permanence under all conditions, and its harmless nature, have long been appreciated by artists

The Red Pigments Red Oxide, Indian, and Venetian Reds These natural oxides of iron are found in many parts of the world, and although the percentage of silica and calcium varies considerably, the ferric oxide content is generally very high Depth of colour depends chiefly upon the extent of dehydration (refer to burnt ochre), a process due to the action of volcanic heat, partial dehydration produces Venetian red (used mainly as a stainer), whilst Indian and purple reds are fully dehydrated varieties

In addition to the natural earth colours which, as we have already

seen, can be calcined to effect changes in hue, synthetic iron oxides, superior both in colour and purity, are now manufactured on a large scale by calcining iron sulphate, or the solutions of iron occurring as by-products in other industries The advantages associated with these artificial oxides are standardisation of shade and chemical composition, brighter colours and fineness of texture, which directly improves both staining strength and spreading capacity.

Red Lead Whenever metallic lead is heated to melting point, the surface layer speedily combines with oxygen from the air and forms a scum which, if removed, forms a yellowish powder *Litharge* or *Massicot* is the name given to this monoxide of lead, and we already know its value as a drying agent In the production of red lead, the massicot is ground, washed, levigated, and reheated in order to absorb more oxygen, about 30 per cent is converted into lead dioxide, whilst 70 per cent remains as monoxide It is not easy to regulate and standardise the exact proportions of these two oxides, thus one must expect some variation in pigments from different sources

Active Drying Properties

It is a fine heavy, opaque bright red pigment, with very active drying properties Its poisonous nature, weight, and liability to discoloration when exposed to impure air, render it totally unsuitable for use other than in oil paints, or as a base for imitation vermilion

As a priming paint for ironwork it is considered superior to iron oxide, its main rival, and there is no doubt as to its value when used in conjunction with white lead, for priming surfaces other than iron Prior to 1927, red lead was obtained in powder form, the paint had to be used within twenty-four hours of mixing, otherwise it became stiff and unworkable The newer form is a semi-prepared variety known as non-setting red lead, which remains usable for several weeks

Vermilion (sulphide of mercury) is obtained by heating a mixture of mercury, sulphur, and caustic potash The colour ranges from scarlet to deep, bluish red and is characterised by great brilliance and opacity Expense limits its use except for small decorative details, and although it is generally quite permanent in both oil and water, it does occasionally revert to the black sulphide state

Antimony Vermilion (sulphide of antimony) Although the brilliance is slightly inferior to genuine vermilion, its opacity, permanence, staining power, and reduced price have earned a definite place in the painting trade for this antimony product The factors which militate greatly against its more general use are its liability to contain free sulphur and its discoloration on contact with active alkaline substances, the latter feature limiting its use in a water medium

Cadmium Red or Silenium Red This recent addition to the bright reds is a compound of silenium, sulphur, and cadmium, plus an extending agent On account of its good colour and all round permanence, including heat-resisting qualities it is gradually displacing the true vermilion

Lake Colours Reference has already been made to coal-tar dyestuffs and their increasing use in the manufacture of pigments Now

vegetable and other organic colouring matter has long been employed for the same purpose, which is to dye or colour a white or translucent basic substance such as blanc fixe, gypsum, alumina, etc., or a coloured base such as red lead, in order to fix, develop, and brighten the dye colouring, and to supply body and any required opacity to the finished pigment

Carmine, Crimson Lake, Madder Lake, and Indigo, are all prepared from organic dyes, the first-named pair being cochineal products, the remainder are of vegetable origin All the cochineal lakes are rather fugitive and are not advised for painting which is exposed to direct sunlight

Vermilionette, Signal Red, Azo-Vermilion, Alizarine Lakes, together with a wide range of other colours, some of which are opaque, others translucent, are gradually displacing the older materials, the best varieties of these synthetic lakes have proved superior in all round qualities There are, of course, cheaper kinds which are liable to fade unless protected by varnish, these colours, particularly the reds, are, unless properly sealed, inclined to bleed through when the work is subsequently repainted

The Brown Pigments *Umber* is by far the most widely used of the dark brown pigments Being a natural earth strongly coloured by iron and manganese it shares all the good properties of iron oxide plus better drying qualities and a translucency which makes it admirable for use as a staining or graining colour The best variety known as Turkey umber, is imported from Cyprus

Burnt Umber, obtained by calcining the raw material, is decidedly warmer and richer in hue, and has greater staining strength

Natural Vandyke Brown This translucent pigment, which owes its colour to iron and bitumen, is used exclusively as a thin glaze or stain Permanence is best assured by using a water medium followed by varnishing When used in oil it is a poor drier, and is liable to melt and run like other bituminous materials when exposed to the heat of direct sunshine

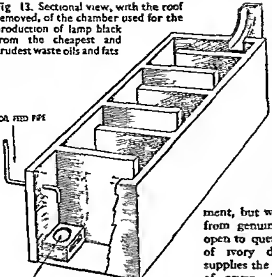
Artificial Vandyke Brown is simply a mixture of ochre, red oxide, and lamp black, all of which are opaque and permanent Such a mixture is useful in distemper work, but as a glaze colour it is muddy and lacking in depth A better variety is obtained by calcining vegetable matter such as cork or beechwood

Sepia is the dried colouring matter obtained from the ink-bag of cuttle fish Although limited to use in water only, it is well known for the wide variety of its tints and shades an invaluable asset when painting in monochrome

The Black Pigments owe their colour and density to the presence of carbon, those rich in this element are known as carbon blacks, others prepared from waste animal matter, contain a large percentage of ash or mineral matter which reduces the value of the product With the exception of graphite (natural black lead), all are manufactured pigments

Lamp Black and Vegetable Black are carbon blacks produced simultaneously by burning the cheapest and crudest waste oils and fats The soot passes by a circuitous route through several chambers and is thus graded into varying

Fig 13. Sectional view, with the roof removed, of the chamber used for the production of lamp black from the cheapest and crudest waste oils and fats



degrees of fineness (Fig 13) The heavier material which collects in the first two chambers is lamp black the finer and less greasy material (known as vegetable black) is deposited in the other chambers in its turn from which it is removed by sweeping

Black Pigments

The black pigments are, without exception noted for their outstanding permanence under all conditions, their easy brushing qualities, and their harmlessness towards other pigments

Drop Black is made by calcining vine twigs and other waste vegetable matter in closed vessels until thoroughly charred The resulting black is rich in carbon fine in texture, intensely black, and non-greasy an ideal pigment for fine decorative work in either oil or water colour

Bone Black and Animal Black These are the cheaper grades of black, prepared by the calcination of bones and waste animal products The pigments contain more ash than carbon and are, consequently, less intense and inclined to greyness They are, however, largely used both in paints and in shoe polishes

Ivory Black All painters are familiar with this fine, intensely black pigment, but whether it is still made from genuine ivory chippings is open to question The newer title of ivory drop black probably supplies the clue to its real source of origin Like drop black, it makes a useful glaze colour

Graphite is obtained both as a natural and synthetic pigment Its extraordinary smoothness and easy working properties impart enormous covering capacity to paints made from it Owing to its metallic appearance and lack of density, it is frequently tinted and supplied in dark shades of blue, green brown, and lead colour Its tendency to flake is corrected by the admixture of silica On exterior ironwork, these paints have been found to possess great durability and anti corrosive properties

Oil Absorption Some knowledge of the oil content of various paste colours serves to indicate the

TABLE II —LIME-RESISTING COLOURS FOR USE IN DISTEMPER

Whiting	Venetian red	Ultramarine blue
Golden ochre	Indian red	Lime blue
Raw sienna	Raw umber	Lime green
Dutch pink	Burnt umber	Zinc green
Zinc chrome	Artificial Vandyke brown	All black pigments
Burnt sienna		

proportion of oil and turpentine necessary to produce gloss, semi gloss or flat finishes and also forms a useful guide in determining the amount of driers required in each case In view of the wide differences in the physical properties of pigments from various sources considerable variations will in some cases be found and Table IV should be regarded as average figures

TABLE III — STAINING AND GLAZE COLOURS

Raw and burnt sienna	Prussian blue
Raw and burnt umber	Terre verte
Vandyke brown	Drop black
Yellow lake	Mahogany lake

Spreading or Covering Capacity

The factors affecting spreading power are (*a*) the bulk fineness and working properties of a pigment (*b*) the medium employed A high turpentine content enables a given quantity of paint to be spread twice as far as would be the case if boiled oil alone were used, (*c*) any type of surface would if rough or porous limit the area covered per gallon of paint whilst smooth non porous surfaces enable the maximum yardage to be coated, (*d*) a good craftsman by 'brushing out' the material will require less paint for a given area than the inexperienced workman who is almost certain to pile it on thickly

TABLE V

Pigment used	Weight per gal. in lb	Area covered per gal in sq yd	Area covered per lb in sq yd
Lead carbonate	28	112	4
Zinc oxide	23	125	5½
Lithopone	24	144	6
Red oxide	19	145	7
Red lead	33	100	3

To make a fair comparison it will be necessary to standardise the conditions under which paints made from the main pigments are tested out The above results (Table V) were obtained upon previously painted surfaces in good condition the paint in each case being thinned for use with equal parts of refined linseed oil and turpentine

When used as a priming coat on wood or plaster surfaces the paint

TABLE IV

Pigment	Oil content per cent	Pigment	Oil content per cent
White lead	6–10	Ochre	20–40
Basic lead sulphate	9	Red oxide	10–30
Barytes	7–9	Sienna	35–50
Blanc fixe	30	Brunswick green	15 25
Lithopone	12 16	Prussian blue	50–80
Zinc oxide	18 22	Ultramarine blue	25 35
Titanium white	25	Umber	30–50
Whiting	18 20	Graphite	40
Gypsum	22	Bone black	50
Red lead	10–12	Lamp black	30–40
Lead chrome	15–25	Carbon black	100–140

would be of a much thinner consistency (Table VI), but as the porosity is so much greater, the spreading capacity per pound of paint would be reduced by about 25 per cent

TABLE VI.—PRIMING COAT ON WOOD OR PLASTER SURFACES			
Pigment used	Weight per gal. in lb.	Area covered per gal. in sq yd	Area covered per lb. in sq yd
Lead carbonate	27	80	3
Zinc oxide	21	85	4
Lithopone	22	100	4½

Rough-Finished Stucco is exceptionally porous, and requires approximately double the above quantity of paint per square yard

The figures in Table VII apply to average surfaces and not to the more intricate work such as girders and similar constructional elements, which naturally reduce the spreading rate

An idea of the relative values of other materials should prove both useful and instructive Table VIII

TABLE VII.—PRIMING COAT ON IRONWORK			
Pigment used	Weight per gal. in lb.	Area covered per gal in sq yd	Area covered per lb in sq yd
Red lead	30	80	2½
Red oxide	18	110	6

shows the spreading capacity per pound of material

Tables VIII, IX, and X clearly illustrate the relationship between weight, volume, and covering capacity, all of which factors must be taken into account in conjunction with the respective costs to form a basis for efficient estimating

TABLE VIII			
	1st coat on new wood work sq yd	2nd coat on wood work, sq yd	2nd coat on iron work sq yd
Refined linseed oil	8½	10	16
Boiled linseed oil	4½	6	14½
White lead	3	4	6
Brunswick green	3½	4½	—
Lead chrome	3	4	—
Lamp black	4½	6	—
Barytes	4	4½	

Paint Mixing Too many formulæ may lead to confusion and thereby defeat their purpose, so the chief aim here must be to simplify the subject by considering the needs of each particular type of surface, and the kind of finish

TABLE IX.—READY MIXED PAINTS AND OTHER FINISHES	
	Covering capacity
Enamel paint (flat)	120 sq yd. per gal.
Enamel paint (gloss)	80–90 sq yd. per gal.
True enamel (gloss)	70–80 sq yd. per gal.
Oil varnish	90–110 sq yd. per gal.
Oil stain	100–160 sq yd. per gal.
Graining colour	300 sq yd. per gal.
Aluminium paint	120–130 sq yd. per gal.
Graphite paint	200 sq yd. per gal.
Bituminous paint	35–40 sq yd. per gal.
Oil bound distemper	6 sq yd. per lb. of paste
Size bound distemper	7 sq yd. per lb. of paste
Plastic paint	1–1½ sq yd per lb of powder
Imitation stone paint	1 2 sq yd per lb. of paint

required The composition of the first or "priming" coat upon new work will depend upon its degree of porosity, rather than its material composition or uses

In practice we recognise four distinct types of surface, each varying considerably. (1) the slightly porous surface presented by hardwoods and by previously painted work which has been stripped by burning off, or other means, (2) new plaster, deal, and other softwoods of a very porous nature, (3) extremely absorbent surfaces such as old brickwork or stucco work, (4) grounds such as previously painted work, ironwork, and surfaces already primed, which are practically non absorbent

The function of a priming paint is to penetrate deeply, to check absorption and to present key or grip for later coats A paint should, therefore, be rather thin and must contain a high proportion of oil to satisfy the requirements of surfaces 2 and 3 On the other hand, types 1 and 4 demand a hard-drying, adhesive coating of greater body and opacity, a result achieved by using oil and turpentine in fairly equal proportions

TABLE X —WEIGHT PER GAL OF VARIOUS MATERIALS (APPROX)

Paste white lead	29	lb to the gal
Oil varnish	9	
Linseed oil	9¼	
Turpentine	8½	
White spirit	8	
Oil stain	10	
Aluminium paint	11	
*Enamel paint	12–16	

* Dark coloured enamels require less pigments and are, therefore, lighter in weight than pale tints

Intermediate Coats The second coat is usually very similar to that specified for the first coating of previously painted surfaces or, if lithopone (or zinc white) is preferred to white lead, the following proportions would be required 14 lb of lithopone, 1 lb paste driers, 1½ pints turpentine, and 1½ pints refined oil

Where tinting colours are added, they may either replace part of the weight of lead (or other basic

TABLE XI —THE COMPOSITION OF PRIMING PAINTS

Type of surface	White lead lb	Red lead lb	Linseed oil pints	Boiled oil pints	Turpentine pints	Paste driers lb
1 Hardwood or burnt off woodwork	14	1	1½	—	1½	½
3 Stucco or old brick work	14	—	—	3½	½	½
2 Softwoods	14	½	2	—	1	½
2 New plaster	14	—	2	1	1	½
4 Previously painted surfaces	14	—	1½	—	1½	½
4 Ironwork	—	14	1	2½	—	—
4 Ironwork (alternative)	—	Red oxide 14	2	2	1	1

white), or be additional to the mixture specified, in the latter case, further thinners and driers will, of course, be necessary, but the original proportions should, as far as possible, be maintained

Varnish Paint Apart from a difference in the medium employed, varnish paint, when compared with oil paint, is vastly dissimilar in composition Ordinary paint contains approximately four parts (by weight) of pigment to one part of medium (much less if turpentine predominates) In varnish paints these proportions are reversed, and colours should be chosen for their fineness and staining strength, the smaller the amount of pigment employed, the higher will be the gloss and, what is equally important, little or no turpentine is required

Paints of this type are extremely durable and tenacious, the latter quality being particularly valuable when painting upon glass, non-ferrous metal, and other impervious surfaces which offer no key to the paint Gloss finishes are naturally deficient in opacity, a quality which must always be obtained by the use of an undercoat of suitable colour

Knotting Patent knotting is a form of spirit varnish used to seal up the surface of knots, before new woodwork receives its priming coat (Fig 14) This material is usually obtained ready for use and it is always advisable when purchasing to specify "genuine shellac knotting" Cheap varieties may contain rosin, which is slow-drying and quite useless as a sealing composition

For those desirous of making up their own material, the following recipe will be found to give every satisfaction dissolve 2 lb of best

TABLE XII — FINISHING COATS

	White lead in lb	Refined linseed oil in pt	Elastic varnish in pt	Turpentine in pt	Paste driers in lb
Oil gloss finish for exterior work	14	1½	¼	¼	½
Eggshell gloss	14	—	¼	1¼	—
Oil gloss finish for interior work	Zinc white 14	2	½	¼	Zinc driers ¼
Eggshell gloss	14	—	—	3	¼
Flat finish	Zinc oxide in turpentine 14	White enamel ¾	—	2½	½

Either of the oil gloss paints would serve admirably as an undercoat for the flatting (flat finish) the eggshell finish would also make the best type of ground colour for the reception of varnish or enamel

orange shellac in 1 gal of methylated (or industrial) spirit, this will take about 24 hours but can be accelerated by shaking the container at intervals No heat is required, and when completely dissolved the mixture needs only sieving in the same way as paint Knotting will remain in good condition for a long time when kept tightly corked in glass or earthenware bottles, but discoloration will occur if stored in tin containers

White Knotting is made from white (bleached) shellac and is not easily prepared, it is thus advisable to obtain the ready-made product

"Stopping" and "Filling Up" Compositions "Stopping" is the term applied to stopping up or filling up the nail, holes, cracks, etc, in either new or old work "Filling" describes the application of a substance to the whole of a surface, with the object of generally levelling and smoothing the work (Fig 15) The term ' Facing up' is frequently applied to the "filling" of small dents, etc, which does not involve the whole surface area "Stopping" and "filling' also denote the material used for that particular purpose

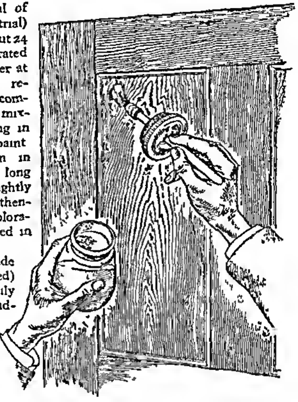


Fig 14 Patent knotting kept in an empty paste pot, will remain in quite good condition for several months

Linseed Oil Putty, made by mixing whiting and oil to a stiff, almost dry, consistency, is the stopping commonly used for the rougher class of work It has several disadvantages, chief of which are its slow hardening nature, lack of strength, and lack of adhesion and smoothness when required for facing-up purposes

White Lead Putty, which consists of four parts of putty to one of white leed, is infinitely better in every respect, and is frequently specified

Hard Stopping can be made by adding litharge to white lead putty, thus causing the material to harden off overnight A better composition which hardens in a few hours, is very tenacious, works smoothly, and is equally good as a filling-up composition, can be made by mixing equel parts (by bulk) of white lead in oil, whiting in gold-size, and whiting in turps, the whole to be

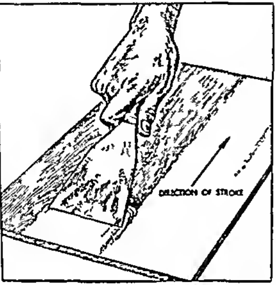


Fig 15 'Filling up' describes an operation which ensures a general levelling and smoothing of the work

mixed to a suitable consistency with japanner's gold size (Fig 16).

Slate Filler is an excellent material for use in a gold size medium. It is obtainable both as powdered slate and as a ready mixed oil paste filler. The powder requires the addition of equal parts gold size, hard varnish and turpentine and can be applied stiff by means of the broad scraper, or can be thinned out and brush applied. Almost any finely ground pigment in oil can be used in conjunction with whiting gold size, and turpentine to form an efficient filler.

Distemper Fillers are those which require water as the mixing medium. Oil bound, or size bound, distemper, when mixed with a small amount of dental or other fine plaster of Paris, forms a useful and reliable composition. Of the ready prepared varieties, Alabastine is probably the best known. These fillers are applied by means of the broad scraper or trowel and are suitable for the larger areas. They set quickly, so must be mixed as and when required for immediate use.

Unlike oil paste fillers, which are rubbed down by a waterproof abrasive process distemper fillers must be smoothed down with No 1½ glasspaper when hard and dry, while the former are elastic in character the latter are always hard.

Fig 16 Hard stopping must be well mixed upon a smooth palette board until the stiff paste is free from coarse particles.

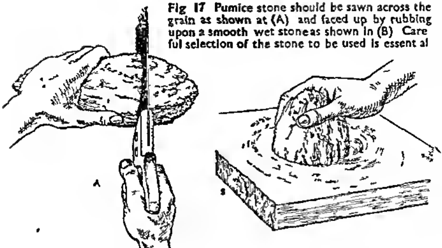


Fig 17 Pumice stone should be sawn across the grain as shown at (A) and faced up by rubbing upon a smooth wet stone as shown in (B) Careful selection of the stone to be used is essential

and brittle, a fact to be considered wherever surfaces are subjected to vibration

Abrasives Since 1927, when the lead paint regulations came into operation dry glasspapering is strictly forbidden except upon unpainted surfaces water-paints and distemper fillers consequently, more efficient and safer abrasives are now in general use

Pumice Stone is an indispensable smoothing material which may be used either in its natural state or ground up into a fine powder and moulded into blocks or the powder may be sprinkled upon a piece of wet felt and used for smoothing down varnished surfaces

Natural Pumice Stone is sawn across the grain and then rubbed on a smooth piece of stone to produce the level surface required (Fig 17), it should be light in weight and open in texture, otherwise the pores quickly get choked with paint, and time is wasted producing a new surface

Prepared Pumice Blocks are rather more costly, but being free from the disadvantage just mentioned, they are great time savers Those containing a percentage of soda are excellent materials for cleaning smoothing and levelling the rougher surfaces of old paintwork or of oil paste filler

Steel Wool has not yet gained the wide popularity which it merits as an abrasive It is efficient for either dry or wet rubbing down is economical, and like the other materials is obtainable in grades ranging from coarse to very fine, the latter may be used in place of

Fig 18 Steel wool is an excellent substitute for pumice stone or sandpaper

pumice powder for "flatting" varnished surfaces (Fig 18)

Glasspaper and Waterproof Glasspaper Glass and various forms of grit are fixed by means of ordinary glue, or, in the case of waterproof varieties by means of waterproof cement, to a stout paper backing Both carborundum and glass are used for the coarser

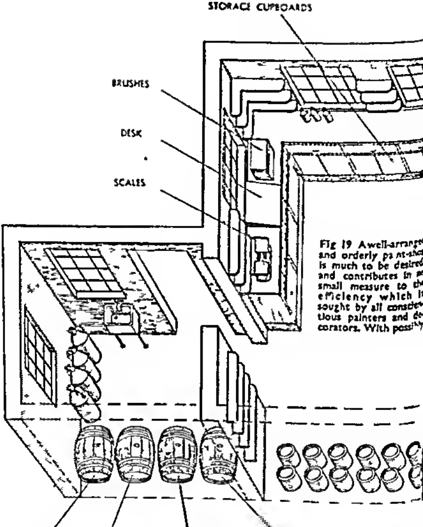
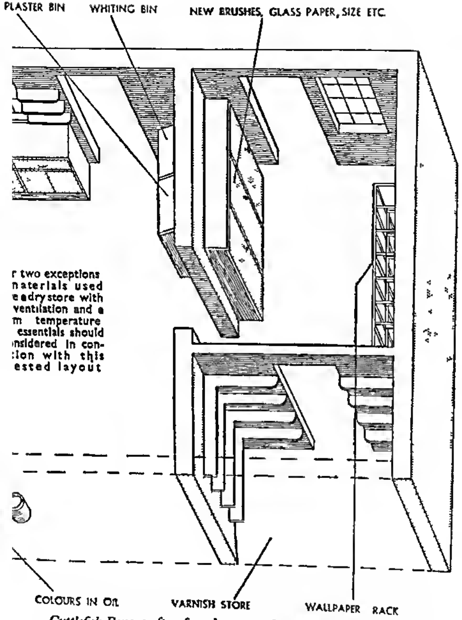


Fig 19 A well-arrang
and orderly paint-sho
is much to be desire
and contributes in
small measure to th
efficiency which i
sought by all conscie
tious painters and de
corators. With possi

grades, whilst flint agate, and fine emery are more suitable for fine grades

Although waterproof glasspaper was designed to prevent the formation of poisonous dust when smoothing down painted surfaces, it is positively the most effective abrasive one can use upon intermediate coatings Dry rubbing down does little more than remove grit but the wet method levels out brushmarks, oil fillers etc and gives a surface smooth as glass



Cuttlefish Bone is often found on the beaches of our southern coastline and when cut across the grain, stripped of its hard outer shell and faced up like pumice stone, it is used for the wet rubbing down of undercoating varnishes prior to the application of a second or third coat On a well-prepared surface it is the best abrasive for the purpose and is employed when the final coat is to be hand polished

Rotten Stone, Putty Powder, Fine Whiting All have a mild abrasive

action upon painted surfaces and are employed in conjunction with a cotton-wool rubber to give the necessary fine finish when hand-polishing a varnished or enamelled surface Rotten stone is used with oil as the lubricant upon dark surfaces whereas putty powder and whiting are employed upon the more delicate tints

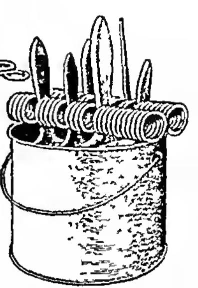
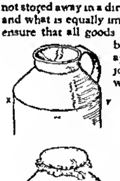


Fig 21 Two types of brushholder which enable the brushes to be suspended at the correct level in water or in the case of varnish brushes in oil

Paint Shop and Store A well planned and properly arranged paint shop should have a good influence on the general efficiency of the whole staff a place for everything and everything in its place is a rule to be strictly observed at all times The storekeeper or other responsible person should see that brushes and other appliances returned from the various jobs are not stored away in a dirty condition and what is equally important is to ensure that all goods sent out are booked to the appropriate job and again weighed and checked off immediately they are returned Two books will be required one in which to book materials the other to record the movements of plant and appliances The use of identification marks (usually numbers) upon the various ladders planks etc simplifies the keeping of records

Fig 19 illustrates an arrangement designed to make the most of the space available Conveniently placed shelves and cupboards will enable stock to be displayed in positions where it is most easily located and checked Colours in oil turpentine water or powder should be grouped separately,



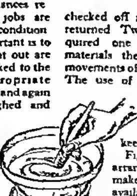


Fig 20 Mixed paint requires to be sieved frequently The top of a 1 gal paint can cut as shown at dotted line X Y and covered with muslin as at Z, makes an excellent paint strainer

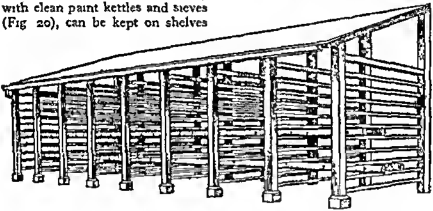
the last being kept in dust proof containers To avoid waste, all colours must be prevented from skinning over or hardening on the sides of containers, if these are kept free from accumulated colour, and the pigment is levelled off and covered with the appropriate medium (oil, water, or turpentine) each time it is used, colours will remain in excellent condition

Small quantities of the chief staining colours, with oil, turpentine, and liquid driers, will be in fairly constant use These, along with clean paint kettles and sieves (Fig 20), can be kept on shelves above the paint bench A few 1-gal tins, with close-fitting lids, will be useful for holding remnants of paint returned from jobs, light- and dark-coloured smudge to be kept separate Two other tins, one containing about a quart of paraffin, the other white spirit, are useful for the rinsing of sieves and brushes

Paint brushes, when not in use, are best kept in one of the special brushholders equipped with a cover to exclude dust and with some device which enables the brushes to be suspended (Fig 21)

Inflammable materials should be kept apart from the main building Some form of annexe, or lean-to arrangement, makes a suitable structure A strongly built platform, 1 ft above ground level, is needed to accommodate barrels of oil, turpentine, etc , and several drums ranging from 1 to 5 gal can be kept filled ready for immediate use

Plant and scaffolding should be stored in some easily accessible place, not necessarily indoors, but certainly beneath the shelter of a roof A paved or cement floor is more satisfactory than earth and, in any case, 3 in by 3 in timber should be used as bearers to keep planks, etc , from contact with the ground Ladders are frequently supported upon wall brackets, but this procedure may cause longer ladders to become twisted out of shape A better and more easily accessible arrangement is shown in Fig 22 Ladders are supported by rollers, placed at the correct height, in racks 10 ft apart The rollers may be of wood or iron and are placed 6 in apart Step-ladders and trestles may be placed upright and arranged according to length.



PRACTICAL ARRANGEMENT FOR STORING LADDERS

Fig 22 Storage rack for long ladders which are raised above the ground and rest on rollers By this means they are easily removable or replaced as required

CHAPTER II

TOOLS AND EQUIPMENT

PAINT BRUSHES—IMPORTANCE OF QUALITY DIFFERENT TYPES OF BRISTLES METHODS OF FIXING BRISTLES CARE AND TREATMENT OF BRUSHES TYPES OF BRUSHES AND THEIR PARTICULAR USES WRITING AND LINING PENCILS TOOLS FOR APPLYING GOLD LEAF PAPERHANGERS' BRUSHES AND TOOLS PALETTE AND OTHER KNIVES SHAVE HOOKS DIPPERS AND HAND BOARDS. PAINT KETTLES AND PAILS TRESTLES STEP-LADDERS TRAVELLING CRADLES *SCAFFOLDING EQUIPMENT. SPECIALISED SCHEMES OF SCAFFOLDING*

SUITABLE tools and equipment are essential if full advantage is to be taken of ability In different parts of the country they vary considerably in design However, one factor is constant, the best are generally the least expensive in the long run This is especially true of brushes

It is, perhaps, more difficult to determine the quality of paint brushes than that of any other articles with which decorators have to deal Therefore, all who have to employ them should have some knowledge of the materials used and their method of manufacture

Brush-making

The materials were at one time more restricted than they have been within the last few years, during which the hairs of almost every kind of animal and many varieties of vegetable fibre have been pressed into service The most important animal products used are the hairs or bristles of the pig, horse, badger, goat, bear, skunk, and the ox, and the fur of the sable, marten, and squirrel The fibrous part of whale fins and split whale-bone are also used extensively Mexican fibre, bass, bassin, kitool, coco, and cane are the principal vegetable materials used Artificial fibres have been produced from india-rubber, cellulose and other similar substances

Bristles Used

There can be no doubt that the most suitable material for making brushes with which to apply paint, varnish, or distemper is the bristle of the pig The demand for cheaper brushes is mainly responsible for the use of other materials, although, for some purposes, which will be indicated later, bristles cannot be used

The descriptive terms "All Bristles" and "Warranted all Bristles" are intended to convey the meaning that the brush contains no other material, but it is known to have been applied rather loosely by some makers

All pigs do not produce bristles suitable for brush making The most suitable varieties are obtained from the colder parts of Europe and Asia, where nature demands a thicker covering Weather conditions have an important influence in regard to the quality of bristles, which also varies considerably according to breed and environment. The best

bristles come from Russia, unfortunately the supply has tended to diminish within the last twenty-five years However, bristles of very good quality come from China and India

There are many countries where there are enormous numbers of pigs, but their bristles are of poor quality and not suitable for brush-making Pigs bred primarily for food develop more fat and, therefore, have not the same need for good coverings of strong bristles as is the case in countries where the animal runs more or less wild

Main Properties

The particular qualities associated with hog bristles which make them so very suitable for brush-making are elasticity, combined with strength and hard wearing quality, plus wiriness, with a sponge like consistency enabling the brush to pick up and hold a quantity of liquid

The root end of a bristle is secured in the ferrule or stock of the brush, and it is the split or flag end which is applied to the surface to be painted Bristles have a natural taper, they are bigger at the root end This tapering is characteristic of bristles and provides a means of distinguishing them from other materials

Hairs Like Saws

The outer coverings of nearly all animal hairs are like fine saws, but in bristles the serrations are much more pronounced

When they are rubbed between the finger and thumb these serrations cause the bristles to move in one direction according to which way they are turned This is taken advantage of in sorting As the teeth incline towards the thin end, this also helps to retain the bristles in the ferrule or casing It is impossible to secure the bristles properly in the ferrule if they are the wrong way round They tend to fall out when the brush is shaken

There is a natural curl or bend in pigs' bristles This enables the brush maker to turn the bristle in or out according to the type of brush he is making For brushes in which straight bristles only are required, the curl or bend is taken out

Though brushes have to withstand very hard wear, they are easily ruined If kept in a damp place, decomposition rapidly sets in Strong alkaline solution will quickly take all the life out of the best brushes Certain acids are equally destructive Bristles should not be put into very hot water, it causes them to lose their natural springiness and become soft and flabby Lime also has a bad effect and special brushes are made which may be safely used in it

Troublesome Pests

Insects are liable to do considerable damage Moths lay their eggs in the "flag ends, grubs and maggots develop and destroy the bristle Brushes in stock should be frequently examined and any eggs shaken out Also, they should not be allowed to remain damp for long periods as they are liable to develop other troubles of various kinds

Moths are difficult to destroy and so prevention is better than cure Naphthaline, camphor, and other preservatives can be used, but cannot wholly be relied upon

Bristles vary considerably in quality and usefulness The deciding factors are length, stiffness,

and colour White or lily bristles are the most expensive, 6 in lily bristles from Russia may easily cost many pounds as against the shillings per pound for short grey bristles Chinese black bristles are less expensive

Horse hair and fibre are used extensively to replace bristle in the effort to meet the demand for cheaper brushes These materials in no way possess the qualities necessary for the making of a first-class brush, and their use is as *adulterants and for price reduction* only

The trade term for horse hair is ' Drafts " The tail and mane hairs are used and they are straightened and drafted into lengths of from 5 to 36 in These hairs are soft and have little resiliency They have slightly serrated follicles no roots or flags and do not taper like bristle

Cheap Substitutes

The stem fibres of the aloe tree *which grows in Mexico is the next* adulterant in order of importance It is cleaned combed, and drafted into bundles from 6 to 30 in long Being of a woody nature they have neither spring nor a splitting tendency, and are not serrated or tapered They are the cheapest substitute for bristles used by the brush makers However they are useful for making brushes for lime washing and for other alkaline materials such as caustic paint removers

A simple test of bristles versus fibre is the application of a match Bristles only singe, fibre burns like wood

The badger, found principally in Central Europe, provides hair for the making of softeners The long hairs of this animal are really the only material suitable for incorporation in brushes employed in graining processes

The sable, found chiefly in Northern Asia, and the marten, which is of the same family, provide from their tails hair for the making of writing and lining pencils or brushes Ox hair is frequently used as an adulterant in these brushes Ox hair writing pencils are made and are useful in paints made of heavy-bodied pigments

"Camel hair" Brushes

The tail of the squirrel provides material for making ' camel hair, writing, and lining brushes for use in light weight pigments and gilding tips, gilders' mops, dabbers, and lacquering brushes Goat hair is a cheap imitation and is not nearly so satisfactory Skunk hair is employed in the making of flat varnish brushes 'and for other purposes

It will be noticed that various members of the weasel family make *important contributions toward the* requirements of the brush maker Fashion has some influence on supplies and prices The skins of animals, and more particularly the tails are used extensively in the fashioning of ladies coats One garment may comprise several hundred tails and these are lost to the brush makers

As may be expected *different* countries have their own individual ways of preparing their materials Russia sends bristles tied up in large bundles In China and India they tie them in small knots Siberian bristles are tied up in bark

There are recognisable differences in the bristles from different countries Russian bristles are only slightly tapered at the flag end Indian bristles are thick at the roots

and thin off suddenly to ragged flags, sometimes extending half-way down the bristles Chinese bristles have thick roots and gradually taper to thin flags Russian bristles are mostly white or yellow, and those from China and India are black The quality of the flag end of the bristle is of the utmost importance The poverty of flag in Indian bristles reduces their resistance to hard wear

In the making of a brush, the bristles selected may not all be of the same length, various lengths are used in different proportions Obviously, a brush of good quality will contain its correct proportion of full-length bristles, while a brush of lower quality may contain a fairly high percentage of shorter bristles Various lengths, however, have to be used according to the setting of the bristles Some brushes are bevelled by the arrangement of the bristles of varying lengths

The mixing of bristles of various sizes for each brush is done by hand By a process of combing and dividing the quantity of bristles several times, the various coloured bristles and their lengths and quantities are merged uniformly

Defining Bristles

The term 'All Bristle generally means what it says All Hair' indicates the presence of bristle and horse hair, while 'Union" quality brushes contain bristles, horse hair, and fibre Horse hair or fibre can be recognised by an examination of the top end of the brush, the blunt ends being easily detected amongst the split flag ends of the bristles In bevelled brushes the bristles are arranged in lengths or stepped in ½ in or ¼-in variations of length

It will be readily appreciated where the principal expense lies in the production of good quality brushes The high cost of bristles and the amount of work involved in their preparation unfortunately encourages the demand for cheaper brushes

Brushes especially made for particular and special purposes are the proper tools to use for these purposes, any others must be inadequate and cannot function effectively There is always difficulty in squaring the brush-makers' point of view with that of the buyers, and far too frequently quality is sacrificed to price, and work done with inferior brushes is adversely affected accordingly

Making a Brush

There are many patterns of brushes manufactured even for the same purposes Generally a brush consists of three parts, bristles, ferrule, and handle The ingenuity of the craftsman has been well tested to discover the most effective means of uniting them so that they do not become easily detached during use

The most costly items in making distemper and paint brushes are the bristles The scarcity and value of long bristles demand that they should be handled carefully The quantity of bristle required for each type and size of brush is determined and weighed with great care These weights are checked so that there is no overweight or underweight The brush-maker then manipulates the bristles in such a way that the natural curl is made to curve toward the centre as for a pound brush, and from the centre for a jamb brush or dusting brush

The bristles which have been so

laid up are tied into small knots or bundles, to the root end of which a suitable cement is applied, the cement varying according to the purpose of the brush Until recent years the cement used for paint and distemper brushes was mainly rosin, and glue for varnish brushes Rosin is easily dissolved in turpentine and glue in water; therefore, glue set varnish brushes should not be used in water or rosin set ones in turpentine The limitation in the choice of cements imposed an obvious handicap In more recent years new cements have become available, and vulcanised rubber has almost entirely displaced the older materials used for purpose

Connected by Ferrule

Every effort has been made to exploit methods of fixing without cements In order to fasten the bristles of two- or three-knot brushes to the handles, copper wire is wound round the cemented ends of each separate knot The bristles and handles of round- or oval-socketed paint brushes are connected by ferrules which are forced over them The seamless metal ferrule is the best for the purpose It is forced over and then compressed to the required shape

Sash tools are forked or socketed The forked sash tool generally bound with twine, is made to-day in precisely the same way as it was a hundred years ago and, though the method adopted is not the most secure, this tool is preferred by most good craftsmen who, by their training, know its limitations and advantages

The seamless metal ferrule, frequently of rustless steel may contribute some improvement to the method of securing bristles to a handle, but there is a lack of balance in the metal bound tool On the other hand, the metal ferrule certainly provides a more secure method of fixing, and the bristles stand up to rougher usage and are less liable to be adversely affected by some of the constituents of modern paints

In flat varnish brushes, wall brushes and a few others the bristles are held in position by sheet-metal bindings secured by rivets which pass through the bristles and prevent the flat ferrules from springing open There are patterns of flat or semi-flat brushes in which the bristles are held by seamless ferrules without rivets Generally, these ferrules are heavier than the sheet metal bindings Quills and round metal ferrules are employed for small brushes such as pencils for writing, lettering, etc Usually, the method of connecting the bristles to the handle is the same The size and shapes of ferrules and material of which they consist are varied The patterns of handles also vary considerably Many of the variations do not arise out of utility but are details of presentation or salesmanship

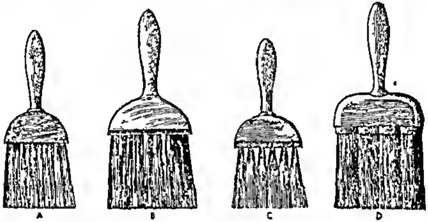
The appearance of a brush counts for much in salesmanship The decorative craftsman often varnishes the handle of a new brush probably giving it a few coats of knotting in order that it may be easier to keep clean and more comfortable to hold But the manufacturer finishes handles as a matter of salesmanship

Brushes are made in many shapes sizes, and qualities Frequently the same type of brush is varied in the pattern of the handle only In fact, the shapes of handles

vary unnecessarily, often at the expense of efficiency There are as many as twenty variations of handles made for precisely the same brush The demands of brush buyers vary considerably, they have peculiar fancies The manufacturer, anxious about sales, tries to meet these demands without necessarily having any sympathy for them

Manufacturers receive many cement settings This may even destroy the bristles Of course, it is practically impossible to guarantee that every bristle is individually secured Therefore, a few are sure to be loose, especially those which are short

The well-trained craftsman knows exactly how to break in a new brush The pound brush for example, should be used for a



DUSTING BRUSHES

Fig I Brushes shown at (A) and (B) are set in pitch and vulcanite respectively whilst the one illustrated at (C) is set in ebonite and (D) in metal rings in rubber

complaints, mainly about loose bristles Generally, an investigation proves that there is nothing fundamentally wrong with the brush, but that it has not been properly stored The bristles in a good brush are very securely attached to the handle but water may cause the bristles and handle to swell and stretch the binding When they become dry shrinkage takes place and causes the bristles to loosen so that sometimes the knots slip down If the brush is well soaked before using this will be prevented

Bristles are liable to become loose if brushes are used in alkaline or acid solutions which soften the period upon a comparatively rough surface The few loose bristles will quickly work out If short bristles persist in coming out, the fault is obviously in manufacture and probably due to the incorporation of unsuitable material

Many Methods

A brush used in oil paint is best kept in water The water should not be above the bottom of the string or metal ferrule binding If a brush is to lie idle for a considerable time it is better to wash it clean with soap and warm water Varnish brushes should be kept in clean linseed oil this being changed from time to time Care must be

taken to clean out the oil before putting the brush into varnish or the drying of the varnish may be delayed If washed out in turpentine, particles in the stock may be set free and impair the excellence of the finish

Brushes should not be kept in turpentine, it has a hardening effect upon their bristles

Distemper brushes must be well washed and kept in a moderately dry place Unused stock should be examined at frequent intervals and moth kept at bay or much damage will quickly result The care which the craftsman bestows upon his brushes will, in fact, indicate the measure of his efficiency

Brushes made by members of the British Brush Manufacturers' Association are generally guaranteed and have the word *British* on them Foreign made brushes need bear no indication of the country of origin, though they must at least be stamped "foreign" Foreign manufacturers are under no guarantee, nor are they liable under the Merchandise Marks Act as to correctness of weight or material or for false trade descriptions It is sound policy to buy British

Personal Fancies

It has been noted that there are many patterns of the same kind of brushes These variations do not always arise out of utility so much as fancy They are usually encountered in the brushes which the craftsman buys himself They are those of a personal nature such as brushes for lettering and ornament But most of the brushes have to be supplied by the employer, and a good stock involves a considerable outlay

Cleanliness in working is essential, all tools and equipment must always be kept clean A good craftsman takes a lot of pride not only in his personal equipment, but in all that which is entrusted to him

Clothing Required

It may be apt, at this junction, to refer to the clothing which has to be worn during the period of work Tests have proved that a considerable amount of dirt and paint of one kind or another inevitably gets on the clothing worn, and that some definite protection is essential Therefore, under the instructions issued and arising out of the Lead Paint (Protection Against Poisoning) Act, all have to wear some covering such as a white jacket and apron or overalls Patterns vary considerably The important point is that they should fit freely and in no way hamper movement, that they should be of good material which will withstand frequent washing, as conforms to the regulations Aprons should not be too long or they will impede movement, especially when climbing ladders and trestles Generally, they should have a large pocket in which the craftsman keeps sundry tools he may be using, notably stopping knife duster, etc Some prefer the pocket divided into two The pocket should be so fashioned that it does not sag or tools may drop out and should the painter be some distance from the floor, may result in an injury to someone below Further, it should always be kept in repair

The dust brush is essential to cleanliness It is made in two forms The round, wire-bound, socketed duster is not used so frequently in these days as the flat jamb or dust brush (Fig 1A and 1B) This varies

in width from 3 to 4½ in, and is about 1½ in thick The bristles are usually black or grey and their lengths varying from 3 to 4 in A well-made 4-in duster with 4 in to 4½-in bristles is a very useful tool The material in which the bristles are set may be pitch, rubber, or vulcanite Those set in pitch should be used only as dusters The bristles are set in rows of three and four small knots Dusters in which the bristles are set in vulcanite or rubber may be used for scumbling, etc They withstand the action of oil and turpentine Pitch set brushes are not suitable

A new arrangement of bristles has been introduced, the bristles being set in metal rings or ferrules in rubber and in three or four rings or knots (Fig 1D) They are not so resilient as the older type of flat jamb brush If the bristles are short, such as in the 3 in size, the use is limited Dusting brushes should be washed from time to time Fig 1C illustrates a dust or jamb brush made on a different principle The bristles are set in an ebonite plate These brushes can be washed in turpentine without affecting the setting in any respect

Best Brushes

The best brush with which to apply paint, especially on large surfaces, is the ground brush, more frequently called the pound brush The length of bristle varies according to the size of the brush, 4/0 to 6/0 being the most popular sizes, they have bristles of 4 to 5 in in length An 8/0 brush is obviously a fairly large one and has bristles 5½ in long These brushes require to be bridled with a good quality twine before being put into paint Prior to bridling an oval

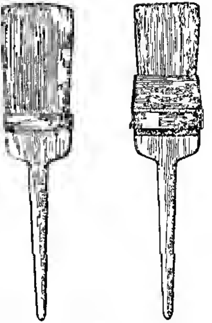


Fig 2 Ground or pound brushes are especially useful where a considerable surface has to be covered with paint

brush some craftsmen insert a thin slip of wood in and across the centre to keep the brush flat

The shape of the ground brushes is round or oval The round types are used a great deal for railway work The oval types are better, and many fine jobs have been carried out with them In working, they must be kept square with the surface or they may develop twists Fig 2 indicates two ground brushes, one of which is bridled

It will be noted that the bridle in Fig 2 (right) is extended about one-third the length of the bristle Several twists of the bridle must be taken off after the brush has had a few days' wear After binding the brush should be soaked in water this shrinks and tightens the twine, though if it is too tight it will throttle the brush Remedy is a new bridle not so tightly applied The

bridle may be allowed to dry and then twice knotted or varnished with a quick drying varnish to preserve the string The wooden handle should also be coated

Good Economy

These brushes are comparatively expensive, but worth all that is spent on their purchase In the hands of a skilled craftsman they will more than outlast a similar expenditure on flat brushes It is to be regretted that this excellent tool has been so largely displaced by the flat brush which is definitely inferior as a paint spreader

The bristles are attached to the handle by copper wire or seamless metal ferrule The bristles are grey, capped with white lily or all grey These brushes are also made with Chinese black bristles When in paint, but not in use, they should be scraped out and suspended in water The handle of the brush may be bored and a piece of stiff wire passed through to support it on the sides of a trough or paint kettle The hole must not be large or it will weaken the handle Several brushes can be put on one wire

The brushes ought not to be allowed to stand on the bristle ends in a paint kettle as this is liable to cause twists to develop

Developing the Bevel

After several days of use these brushes develop bevelled ends which enable the craftsman to lay off paint very finely

The black bristled ground brush is not so efficient but it is more efficient than the flat brush. A well worn ground brush is a very efficient tool with which to apply varnish and enamel

Fig 3A is a forked sash tool The bristles vary in length in accordance with the size of the tool and are cement set It is string bound The bristles may be all white lily bristles or grey middles capped with lily or all grey or all black The lily capping makes the grey look better from a sales point of view

The general information given about ground brushes applies equally to the sash tool (Fig 3B) which is so named

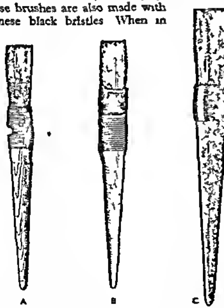
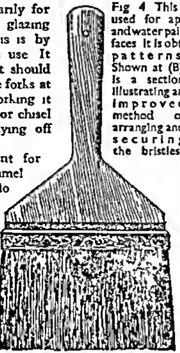


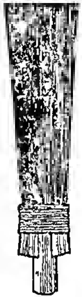
Fig 3 (A) is a forked sash tool which is string bound with the bristles set in cement. (B) shows the bridle string securely fastened by an incision made in the handle, whilst (C) is a sash tool with a pressed metal ferrule.

because it is used primarily for cutting in the sash or glazing bars of windows, but this is by no means the limit of its use It requires to be bridled It should always be worked with the forks at the side With proper working it will develop the bevelled or chisel edge so necessary in laying off paint

Sash tools are excellent for applying varnish and enamel Manufacturers generally do not guarantee them to stand well in varnish, turpentine, etc, if glue set, but they can be obtained in a setting material which will resist the solvent actions of these materials Rubber-set sash tools are quite easy to obtain and are to be preferred



A



B

Fig 4 This pattern brush is used for applying distemper and water paints upon large surfaces It is obtainable in various patterns Shown at (B) is a section illustrating an improved method of arranging and securing the bristles

A sash tool with pressed metal ferrule (as shown in Fig 3C) is not so popular as the string bound tool

Sash Tools

The sash tool, the most common sizes of which are 4, 6, and 8, has been largely displaced by the 1-in flat brush, although the latter does not compare favourably with the sash tool for spreading paint efficiently If a hole is drilled in the handle, sash tools can be suspended on a wire in water when not in use, but the water must not rise above the bottom of the bridle

Note in Fig 3B that the string of the bridle is fastened off by making an incision in the handle into which the string is pressed, and is thus held securely, and not by means of tacks, which is an unworkmanlike method of doing the job

Distemper brushes are of various patterns Yorkshire and Lancashire types have bristles which are usually Russian Grey, varying from 5 in to 6 in in length The width varies from 7 to 9 in, the 8-in brush being in general use The weight of bristle ranges from 6 to 9 oz The most popular weight is 8 oz, beyond that the brush gets rather heavy when charged with material (Fig 4A)

The length and spring of the bristle is important Short-bristled distemper brushes are not efficient The Lancashire pattern has an angular shoulder, and the Yorkshire a shorter square shoulder rounded at the corners It is obvious that this type of brush has good spreading capacity The bristles are secured with leather binding and copper rivets or a riveted metal binding When not

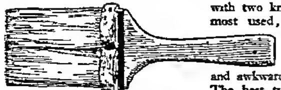


Fig 5. The best type of two-knot copper-wire-tied stock brush very much in favour with trained craftsmen

in use they should be hung up with string threaded through the holes in the handles If left flat on a shelf they are liable to get displaced and the bristles may become crippled Upon completion of a job they should be well washed out with warm water (soap may be used if necessary) rinsed in cold water and shaken out dry If they have been used in washable water paint it is advisable that they should be rinsed in dilute acetic acid or vinegar Fig 4B indicates an improved method of arranging and securing the bristles to give additional weight

In the south of England a narrower type of flat brush is used The bristles are similar in length and kind to the Lancashire and Yorkshire brushes, though they are often capped with lily bristles and have grey middles It may be bound with a strip copper binder, riveted, or a seamless metal ferrule The latter seems to be the stronger method of securing the bristles to the handle and is less liable to spring and become loose The width is from 4 to 7 in, and the bristles are $5\frac{1}{2}$ to 6 in long

The distemper brush in which the bristles are in knots is popular The type with two knots of bristles is the most used, though three- and four-knot brushes are made, they are frequently too heavy and awkward for continuous use The best type of two-knot distemper brush, or stock brush, as distemper brushes are often called, is shown in Fig 5 The bristles may be secured by copper wire, and seamless or flat copper-riveted binding The bristles are usually Russian grey, capped with lily, or all grey Black bristle distemper brushes are made, but do not always prove to have sufficient strength The overall length of distemper brushes is 14 to 15 in If they are reduced in length, they are generally badly balanced.

Scarcity of Bristles

The instructions for storing when not in use, given earlier, apply to all distemper brushes These brushes can be obtained rubber set and in flat or oval copper ferrules The scarcity of long bristles causes the cost of production and purchase price to be high, therefore, every care must be taken of them both prior to issue for use and when in use

When distemper brushes are worn out they may be used for washing off surfaces and in cleaning woodwork, etc. However, special wash-down brushes are made They have grey bristles $4\frac{1}{2}$ to $5\frac{1}{2}$ in in length,

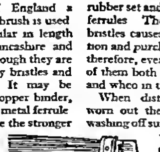


Fig 6. Weatherboard brushes are generally set in rubber and used for painting upon broad, flat surfaces.

arranged flat, or with two-knot fixing Their weights vary from 6 to 8 oz They are also made in hair, fibre, and union.

All distemper brushes and wash-down brushes should be soaked in water before being put into use This tightens up the bristles Neglect to take this simple precaution may result in the ruin of valuable brushes Brushes in which the bristles are set in rubber are not so liable to become loose

Similar Type

Kalsomine brushes are very similar in structure to flat distemper brushes, and are from 5 to 8 in wide, with bristles ranging from $4\frac{1}{2}$ to $5\frac{1}{2}$ in in length They are from 1 to $1\frac{1}{4}$ in thick

Wall brushes are, as their name indicates, brushes specially made for wall work, and are useful for the application of flat wall paints They are $\frac{3}{4}$ to 1 in thick, with a length of bristle from $2\frac{3}{4}$ to $3\frac{3}{4}$ in, the bristle usually being black and rubber set, though they are sometimes made with grey The bristles are secured with flat metal bands or seamless ferrules There are many jobs which can be done satisfactorily with a flat wall brush, which saves more expensive brushes

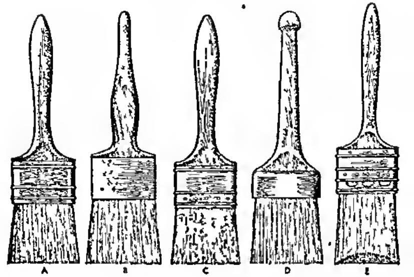
Weatherboard brushes are semi-flat brushes (Fig 6) and are made in widths of from 4 to $5\frac{1}{2}$ in, with $4\frac{1}{2}$ to $4\frac{3}{4}$-in grey bristles Better-finished types, however, are capped with lily bristles They are very useful on weatherboard and similar broad flat surfaces The setting is generally rubber

Flat varnish brushes are of a fairly standard pattern, variations relate mainly to the shapes of handle and moulding of the casing They are made in various widths from $\frac{1}{2}$ to 4 in The bristles are 2 to $2\frac{1}{2}$ in long The best quality have lily bristles with cedar-wood handles The type mostly used have stiff black bristles and white wood handles The setting is rubber and the casing of flat metal which is moulded to give it additional strength and which is secured by rivets or pins passing through the cement The ends of the bristles are bevelled, but square-ended flat brushes are made Fig 7A indicates a good specimen, and Fig 7B a variation in pattern of the handle which is not so comfortable to hold This pattern of handle frequently breaks at the shoulder, maybe owing to its being used for other purposes than that of spreading paint and varnish

Three Thicknesses

These flat varnish brushes are made in three thicknesses, "thick," "extra thick," "double thick" Fig 7C is a flat varnish brush with nickel plated case and lily bristles For all general work the "extra thick" brush seems to be the most suitable The "thick" has not sufficient strength for many purposes for which this type of brush is used The "double thick" is deficient in springiness, probably owing to the extra thickness and quantity of bristles Metal cases are used for securing the bristles Flat varnish brushes are, however, made with a longer bristle, and metal bridles are supplied (Fig 7E) The widths vary from 1 to 4 in, and the length of bristles up to 4 in The 4-in brush is $\frac{3}{4}$th in thick

These flat brushes are used considerably for painting, and have, unfortunately, largely displaced the



RANGE OF FLAT VARNISH BRUSHES

Fig 7 Much favoured square-ended pattern is shown at (A) with a variation of handle shape and metal binding (B) At (C) is shown one with a nickel plated base and lily bristles whilst (D) has an oval pressed metal ferrule A flat varnish brush will be seen at (E) with extra long black bristles and a removable metal bridle

ground brush For a paint that really does require spreading, the flat brush is certainly not the best tool A comparison of initial costs may indicate the principal reason for the preference

Oval and flat oval varnish brushes are much better propositions as varnish brushes They hold more material and being fuller in their content of bristle, are stronger The result is that varnish is more easily spread and does not collect and exude from the stock as is frequently the case with the flat brush They are made in widths of from 1 to 3 in The bristles, which are usually set in seamless metal ferrules, are stiff black or grey and rubber set The handle is strong and of good design

This type of brush is very satisfactory It has a fine chisel or bevelled edge and no moulding in the ferrule, which is quite plain It will be obvious from Fig 7D that a brush of this pattern must be one of the cleanest to use It may be used for many painting jobs quite legitimately It spreads varnish well so that the craftsman can apply a good flowing coat As a brush for spreading even the heaviest bodied enamel it is as near the ideal as possible

Decorative Use

Fitches, or hog-hair tools, are made with flat (Fig 8A) and round (Fig 8B) metal ferrules in various widths or diameters ranging from $\frac{3}{16}$ in to about $1\frac{1}{4}$ in The sizes are indicated by numbers, but there is no standardisation in this respect among manufacturers

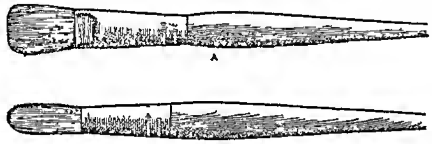
In the best type of fitches the bristles are lily white Those made with black bristles do not seem to be so satisfactory Fitches are used

in decorative processes such as the picking out of moulding cutting in sasbes, etc Maybe, the narrower sizes of the flat varnish brush have to a great extent displaced the fitch Originally, the hair of the fitch, a member of the weasel family was used in the making of these brushes hence the name

Lining Tools

Hog hair lining tools or angle fitches as some craftsmen call them are a thin flat type of brush in which the bristles of varying length are set at an angle (Fig 9A) White bristled lining tools are better than black though the black required for a time Russian tallow or vaseline worked into the bristles will keep them in position

Stencil brushes have short bristles which are set in cement They have casings of sheet tin, pressed metal ferrules are also used and are stronger The bristles at the end are set flat or level The tool is round and varies in size from about ½ to 1½ in The best types have white bristles The black bristled variety do not seem to stand up to hard wear This tool is used for the application of paint through a stencil When a job is completed the tool should be washed out with soap and warm water It is an advantage if a piece of paper is wrapped as a binder round the bristles after washing to keep them from spreading A rubber band will do equally well Fig 9B is an illustration of a stencil tool with rustless steel ferrule



FITCHES OR HOG HAIR TOOLS

Fig 8. Two typical examples one with a flat metal ferrule (A) and the other (B) round The best type of fitch has bristles which are lily white

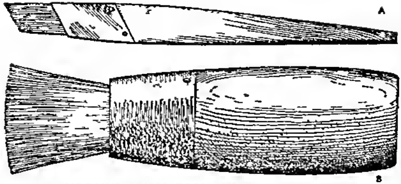
tool is useful for paints containing pigments light in weight

The brush is held at the natural angle indicated by the way the bristles are set and when charged with paint is drawn along the edge of a straight-edge held flat on the surface upon which the lines of varying thicknesses are to be painted

Lining fitches should be taken special care of when not in use A crippled lining fitch can be a great nuisance It should be washed in soap and water when the job is completed and the fitch is not

For Stippling

The stippler used for all ordinary purposes consists of a flat board in which the bristles are set at right angles in small knots at regular intervals White bristles are used in the best type of stipplers Those made with black bristles are not so



HOG HAIR LINING TOOL AND STENCIL BRUSH

Fig 9 Lining fitch (A) and (B) a stencil tool with rustless steel ferrule The former is used for lining and the latter for applying paint through a stencil

satisfactory The normal length of the bristles is about 2 in They are obtainable set in rubber

Various Handles

The handles are varied Some are fixed being continuations of the base boards of the stipplers (Fig 10A) others are reversible and are attached either with slotted screws or thumb screws (Fig 10B) This renders it possible to turn the brush one way or another as may be desired and it can be reversed If incorrectly used all the weight may be taken on one end that nearest the handle and the bristles worn down unevenly the reversible handle obviates this Bridge handles are also fitted and these are quite popular many prefer them as it is considered they make it easier to ensure that the brush is used square with a surface (Fig 10C)

After a stippler has been used it should be thoroughly washed out It may be necessary to give it a preliminary washing in turpentine to loosen the paint It is better to do this in a shallow flat tray The turpentine should not be allowed to contact the base of the brush if it can be avoided If the bristles are not rubber set they may become loose Soap and water are the best materials with which to clean a stippler It should as far as is practicable, be held with the bristles downwards Every effort should be made to avoid getting the base board or wood back wet—it is liable to warp and split The result would be knots of loose bristles

Stipplers are made in various sizes such as 4 by 3 in for small panel work 6 by 4 7 by 5 9 by 7 in etc There is a greatly improved type of stippler it is metal bound non warping and has improved rubber setting

Lettering Brushes

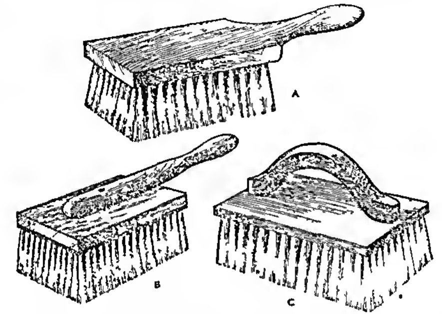
Sable writers are made in quills and metal ferrules The hair is obtained from the tails of the sable and is rather expensive They are of two kinds—red and brown the red being much stronger than the brown The red sable pencil therefore is used in paints in which the pigment is heavy and the brown in the less heavy pigmented paints Sable pencils set in quills are superior to those in ferrules The

type of quill used, such as swan, goose, duck, crow, etc, indicates the size of the brush, but the manufacturer's catalogue numbers used on ferruled pencils do not give any clear indication of the size, neither is there any standardisation of sizes

These brushes, or pencils, as they are called, are made in all sizes, water, this temporarily softens the quill, which may be pressed into the correct shape Handles are sold in bundles and are of assorted sizes

Sable Pencils

These sable pencils are used in the painting of lettering or ornament of every kind, and upon almost every type of surface After



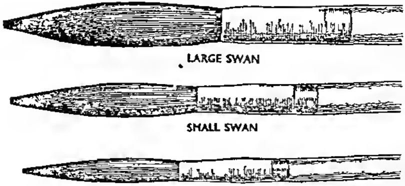
STIPPLERS IN THREE DESIGNS

Fig 10 Stippler with a fixed handle (A) At (B) is one with the handle on back made reversible suitable for all general purposes whilst (C) shows a bridge handle type

the smallest being the lark set in a lark quill and the largest being set in a large swan quill (Fig 11) The hair is so set that the ends of the pencils are flat or square or pointed The square ended pencil is generally known as a one stroke brush Quilled pencils require to be fitted with handles This must be done with care or the quill may be split Should the quill be a little out of shape, it may be adjusted if the end is dipped in hot use they must be washed out in turpentine and greased with Russian tallow or vaseline, this preserves the shape of the hairs Washing in hot water may ruin the hair

Riggers are pencils similar in character to writing pencils, but the hair is much longer They are used for tracing and outlining

Lining pencils are made especially for painting lines particularly on vehicles They are not employed much by the decorator, but



SABLE PENCILS IN VARIOUS SIZES

Fig 11 Sable writers are named after birds the quills of which are used as ferrules Time spent in carefully fitting a stick to a sable pencil is well justified

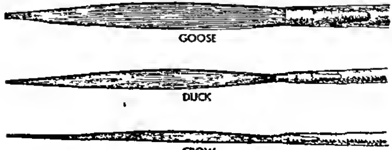
rather by the coach painter however, a well trained decorator may find them useful The brown or red sable hair is much longer than for writers or riggers, being about 3 to 3½ in It requires a lot of practice to draw a fine line successfully with this type of brush (Fig 12)

Short Pencils

Short sable pencils are for use in water and body colour for types of work in which the longer writing pencil is unsuitable The general remarks in regard to writers apply here The length of hair is much shorter, as will be seen in Fig 13

Ox hair writers are made with quills and metal ferrules The hair is much coarser and stronger They are especially suitable for use in heavy bodied paints and work which may not require that standard of technique possible with sable pencils

Pencils incorporate both long and short camel and other hair for special processes The text dealing



LINING PENCILS

Fig 12. These are used for painting fine lines, and to do so requires much practice.

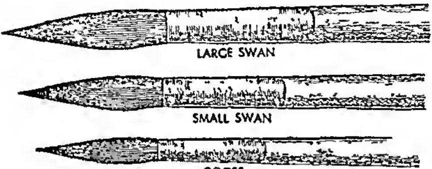
with various processes will indicate for what purpose they may be used

Gilding cushion knives and tips are the principal tools for the application of gold leaf and other leaf metals used in decorative processes There are other tools, such as the burnisher, etc, but they are not so much needed, except for more specialised work The cushion is a flat board of hard wood over which cotton wool is laid very

for applying gold They consist of badger or camel hair which is fixed between two layers of cardboard They are made with short, middle, and long hairs, each for its own particular purpose, which is fully explained in the appropriate section

Camel-hair Mops

Domed mops or dabbers (Fig 14D), for gilding, are in two forms, short and long, i e with and with-



SHORT SABLE PENCILS

Fig 13 These pencils are particularly suitable for water and body colour work

smoothly (Fig 14A), and then covered with chamois leather Part of the cushion is surrounded by a wind guard made of parchment paper On the underside are pieces of leather, one through which the knife may be slipped when not in use and the other through which the thumb is put

Knives and Tips

The gilder's knife (Fig 14B) has a balanced ebony or ebonite handle so that when the tool is laid down the blade will not touch the surface The blade has a flat edge, not a cutting edge as with an ordinary knife, which must be perfectly smooth and clean or it will not cut the gold leaf

Gilders' tips (Fig 14C) are used

out handles They are filled with camel, bear, or badger hair

Paperhangers' brushes are made in grey and white-capped bristle or all grey or all black They vary in thickness and length from thin brushes each consisting of two rows of bristles set in small knots, for light weight papers to thicker ones (Fig 15A) consisting of several rows of similar knots of bristle The length varies froro 7 to 12 in Fig 15B is another pattern, in this case the bristles are set in rings

There are three types of paperhangers rollers The wide roller (Fig 16B) is used upon the surfaces of wallpapers and certain relief materials when a brush would be unsuitable They are

made in various widths from $3\frac{1}{2}$ to 7 in The roller is of boxwood and may be covered with flannel, leather, or rubber The joint roller shown in Fig 16A is used for rolling down joints of wallpaper after hanging It may be boxwood and covered with felt, or of brass or nickel plated and its size is $1\frac{1}{2}$ to $2\frac{1}{2}$ in wide Fig 16C is a boxwood angle roller for rolling down wallpaper in the angles of walls etc

Keep Tools Clean

These tools must be kept scrupulously clean or the surface of wallpaper will be damaged The free working of the roller is important

Paperhangers' scissors vary considerably in pattern and weight Fig 17A illustrates a pair suitable for all ordinary purposes Handles vary (Fig 17B) giving more room for the grip of the fingers These scissors need careful grinding because they have to cut wet paper, care must be taken to preserve the cutting edge Paste, if not washed off quickly, causes rust to develop

Paperhangers' scrapers or stripping knives (Fig 18A) should be of good quality Far too frequently cheap tools are used which are not satisfactory The stripping knife should not be too rigid nor yet too flexible It should be of good steel capable of taking and retaining a good edge They are of various widths $2\frac{1}{2}$ to $3\frac{1}{2}$ in is suitable for general purposes Fig 18B shows a less efficient pattern

Palette knives are used for mixing

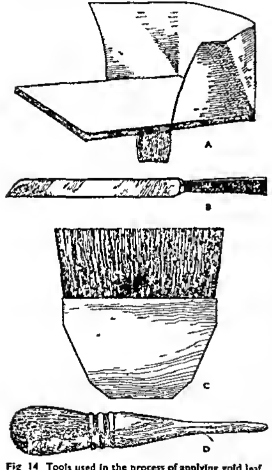
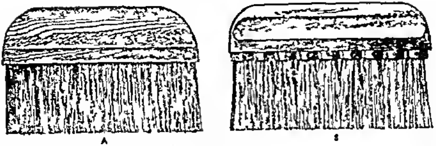
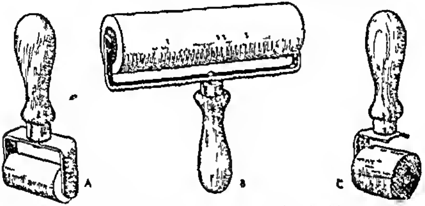


Fig 14 Tools used in the process of applying gold leaf are (A) gilder s cushion (B) gilder s knife (C) gilder s flat brush called a tip and (D) a domed mop or dabber



PAPERHANGERS BRUSHES

Fig 15 Two brushes used for hanging wallpaper On the left the type in general use on the right, a brush for heavier work having the bristles set in rings



ROLLERS USED IN HANGING WALL PAPERS

Fig 16 Joint roller (A) and one used where a brush is unsuitable (B) Angle roller (C) These rollers must be kept clean or wall paper surfaces will be damaged

materials upon hand boards (Fig 18c) They should be fairly flexible and for preference have balanced handles

The stopping knife is used for the application of putty and stopping and general facing up as is required for plain painting It usually has an ebony or ebonised handle It should be made of good quality steel and be flexible One edge is cut on the skew so that it may be used for facing up, etc Every effort must be made to preserve the point When it becomes worn the tool requires re cutting or grinding (Fig 18D)

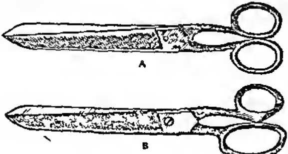


Fig 17 Two varieties of paperhangers scissors (A) being suitable for all ordinary purposes and (B) with elaboration of the handle for firmer grip

A glazier s putty knife is similar to a stopping knife, but

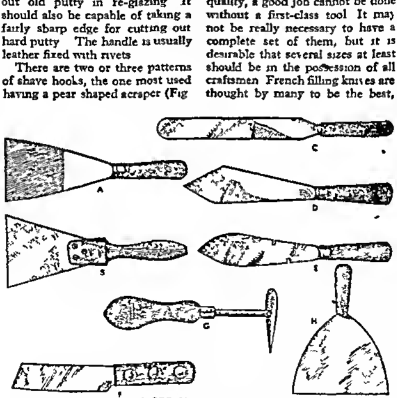
more rigid so that it may withstand the pressure applied when levelling facing putty during the glazing of windows The notches are useful for taking off narrow strips of glass after they have been cut with the glazier's diamond (Fig 18E)

Best Quality

The hacking knife (Fig 18F) should be of steel of a quality that will stand up to the hammering which is inevitable when chipping out old putty in re-glazing It should also be capable of taking a fairly sharp edge for cutting out hard putty The handle is usually leather fixed with rivets

There are two or three patterns of shave hooks, the one most used having a pear shaped scraper (Fig 18G) It is employed by the decorator for scraping paint from mouldings during the process of removing old paint Another pattern has a universal head or scraper, that is, the end has various shapes which can be used to fit different shapes of mouldings

A filling knife is similar in pattern to a paperhanger's scraper (Fig 18H) and is made in widths of from 1 to 6 in Though the average craftsman contents himself with a filling knife of not too good a quality, a good job cannot be done without a first-class tool It may not be really necessary to have a complete set of them, but it is desirable that several sizes at least should be in the possession of all craftsmen French filling knives are thought by many to be the best,



KNIVES FOR VARIOUS PURPOSES

Fig 18. Paperhanger's scraper, or stripping knife (A), a cheaper quality (B), palette knife (C), stopping knife (D) glazier's putty knife (E) hacking knife (F), shave-hook with pear-shaped scraper (G), and (H) a filling knife.

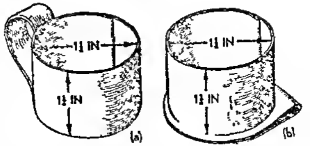


Fig 19 Dippers used by sign writers, for holding in the hand (a) or for clipping to the palette board (b)

but there are English firms which make these tools of a quality equal to any continental knife

A good filling knife has a feeling of quality about it It must be made of really good steel and be flexible, and take and retain a true edge, which, though it has not to be sharp, must be thin The edges of filling knives should be protected when not in use, and this can be done by cutting in a piece of hard wood a saw-cut of the width of the knife and fitting this on the edge If the edge of a filling knife gets damaged, it is almost impossible to restore it

Dippers are small pots which may be made of tinned steel or zinc. They are used for holding the small quantities of paint such as sign-writers require Some prefer them to clip on to a palette or thumb board (Fig 19B), and some prefer to have them handled and dispense with the palette board (Fig 19A) Enamelled or metal cups are suitable for small quantities of paint

Palette boards or thumb boards, are made of thin, hard wood and have holes through which the thumb is put so that they can be held firmly The hole has a chamfered edge to make it comfortable to hold The boards vary considerably in pattern and shape The clipped dipper (Fig 19B) fits on to the edge of the board

Stopping, filling, and mixing boards are essential to all good craftsmen They are flat, hardwood boards, about ½ in thick They should receive several coats of knotting or varnish before they are put into use A stopping board has a face of about 4½ by 3½ in and is handled The filling board is of the same pattern, with a face of about 8 by 6½ in, and is used for holding filling A mixing board is of the same pattern and material The most convenient size is 12 by 10 in for the working face (Fig 20)

Paint Kettles

Not enough attention has been given to the design of paint kettles They are generally made of galvanised sheet metal, with a wire handle attached by means of rivets to ears on either side The space between the ears and around the rivets gets clogged with paint and is difficult to clean The edge is generally wired This also tends to accumulate paint A better type is of zinc with one seam, the top edge being turned over and no wire used The ears are close fitted and no space left in which paint can collect The handle should fall clear of the top of the kettle

Paint kettles should be so designed that the various sizes fit easily one into the other This saves space Paint does not easily attach itself to zinc, therefore zinc kettles are easier to keep clean

Buckets or pails should be well made and light and their handles

so arranged that the pails fit easily one into the other. This saves space. Heavy pails are unnecessary, increase cost of cartage, etc., and are cumbersome to handle. Pails and kettles should always be kept clean. While soda water readily softens paint, it destroys galvanised iron and zinc.

Dust sheets are an essential feature of the equipment of any decorator. Far too frequently the provision of dust sheets, or drop sheets as they are sometimes called, is dealt with in a casual way. Clients have a right to expect that their furniture and fitments should be protected against the dust and dirt inevitably disturbed on every job. Floors and carpets, too, need covering. The ordinary dust sheet is not, however, always the best covering to use. Sometimes light boards or waterproof sheets are found to be necessary.

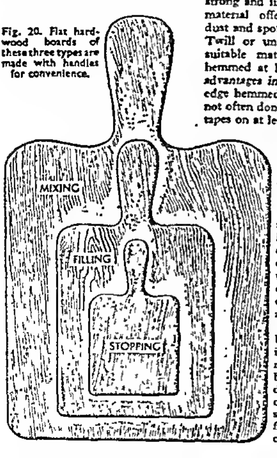


Fig. 20. Flat hardwood boards of these three types are made with handles for convenience.

Protecting Furniture

Dust sheets should be made of strong and fine material. A coarse material offers little protection; dust and spots will fall through it. Twill or unbleached calico is a suitable material. It should be hemmed at both ends: there are *advantages in having the selvedge* edge hemmed also, though this is not often done. The attachment of tapes on at least some sheets often proves useful. Some firms have metal eyelet holes fitted.

The sizes generally used are 12 by 12 ft., 12 by 9 ft., 12 by 6 ft., and 9 by 6 ft. A small sheet, 6 by 6 ft., is very useful to lay on the floor when a door is being worked upon. It is also a convenient size for covering small articles of furniture.

Dust sheets should be washed at regular intervals, and should never be allowed to become loaded with dust and dirt as is often the case, neither should they be used for the purpose of collecting wallpaper

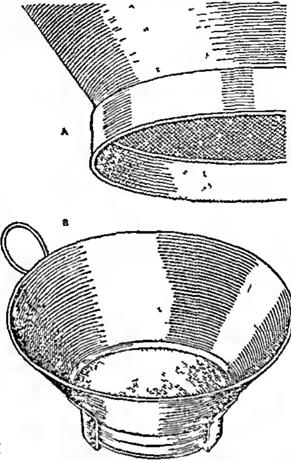


Fig 21 (A) is an extremely good type of paint strainer w th slip in gauze f tted on loose collar (B) is not a recommended type the clips tending to perm t fouling

strippings and other refuse from the job, for which sacks should be provided There are difficulties at times in retaining dust sheets, if one gets torn, it is more liable to become paint rags than get repaired This is often due to bad organisation which fails so frequently to provide rags for craftsmen who need them as an aid to cleanliness Some try to prevent dust sheets becoming rags by having the name of the firm stencilled over them at frequent intervals This may at times have publicity value

Chamois Leather

The goat like antelope which breeds in the mountains of Europe and Western Asia, the chamois has a soft skin which is cured in fish oil It provides the shammy leather so necessary to many operations These leathers vary in size from 16 by 16 in to 24 by 24 in Thick skins should not be selected and those with thin patches should be avoided they develop holes Wash-leathers need to be kept clean, if they are put in soap and water they get slimy This can be remedied by soaking them in a batter of whiting and water and allowing them to dry The whiting may then be shaken out and the leather washed in clean water They should never be put in hot water, it hardens the skin The skins of other animals are also dressed and used for the same purpose, they are a poor substitute

Grass Sponges

Decorators sponges are rather coarser than those used for domestic purposes They vary very much in quality and often contain bits of shell which should be removed The type known as grass sponges are generally used but a better

class sponge is necessary for washing good class paint-work Sponges should be kept clean, and ought never to be put away otherwise, or they will develop an offensive smell

Many patterns of paint strainers have been devised and, though effective for their purpose, few are easy to keep clean The best variety have the straining material,

Fig 22. Handle of this radiator brush is bent to any angle required for the job

usually fine wire mesh, attached to a frame which fits within a larger frame made of galvanised iron or zinc Unnecessary clips and movable parts harbour partially dry paint which is liable to fall in and foul the paint Muslin or linen tied across the top of a paint kettle serves very well for small quantities Larger and coarser strainers are used for distemper, etc Strainers, if not cleaned out when finished with, should be stood in water Care must be taken that water does not get into the paint, it causes it to blister Figs 21A and B are common patterns

A radiator brush (Fig 22) is specially manufactured for painting ironwork difficult of access such as the backs of radiators, rain water pipes, etc. The handle, which is made of a metal able to withstand frequent bending may be bent to any angle necessary to gain access to difficult positions

Paperhangers pasteboards and trestles vary considerably Simple trestles 2 ft 6 in high and 21 in wide, and a pasteboard of two loose or hinged boards 6 ft long and of a total width of 22 in, are satisfactory They should be light, strong and rigid, though cord is generally used to prevent the spreading of the trestles, a light iron bar in two screw eyes and hooks gives a more rigid assembly The trestles do not close up as is sometimes the case when cord is used (Fig 23)

More complex boards are used Some are made so that when folded the space within the collapsed trestles can be used for packing a few pieces of wallpapers The type shown (Fig 24) is a sturdy and rigid pattern It has a ply or basswood top It can be folded up in a minute or so and has obvious advantages in regard to transport

Step-ladders

Steps are an important item They should be made of straight grained selected pine or deal free from knots It must be remembered they have to stand a lot of comparatively rough handling, and be capable of taking a considerable strain in various directions

They must be as light as possible, but strength must not be sacrificed The jointing of the treads into the side must be accurate and their fixing secure Two ¼ in round steel

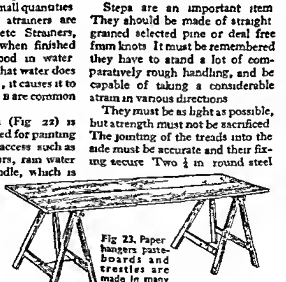
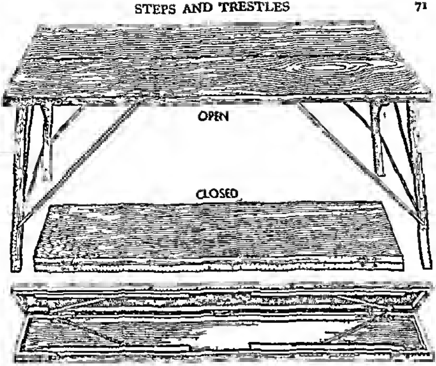


Fig 23. Paper hangers pasteboards and trestles are made in many styles Cord prevents spreading but an iron bar and hooks are safer



PASTEBOARD AND TRESTLES OF IMPROVED DESIGN

Fig 24 Made to fold for easy transport and collapsible into a relatively small size Wallpapers may be stored within the trestles when going to and from the job

rods should be inserted under a tread near the top and at the bottom They should be so riveted over on washers that they cannot come loose The width at the top should be 9½ to 10½ in to take a scaffold board easily Width at the bottom varies according to height

L-shaped hinges should be used to secure the backs and should be fitted on the inside They carry the weight better and less strain is imposed upon them External hingings impose weight in the wrong place and screws too frequently work loose The framing of the backs should be mortised and 2 or 3 in wide according to the height of steps Generally, the timber should be 1 in thick, and the sides 3 to 4 in wide The cords should be of good quality hemp sash line and of such a length that when the steps are open the top tread or step is horizontal with the floor when the backs are fully extended If accidents are to be avoided cords must be frequently examined

There are many patterns of steps to which patented devices are attached Generally, these are not convenient to the decorator for day-to day use The simple and well-tried out pattern so well known is difficult to improve upon for routine work (Fig 25)

Safety Limit

There is a practical factor of safety which limits the height of pairs of steps Very tall steps may be useful for special purposes For routine work above a certain height, trestles are better and safer They

are made in two parts secured by special hinges at the top; these have stops which prevent the trestles being opened beyond a certain distance They cannot, however, be relied upon except for short trestles (*Fig 26*) Tall trestles impose too great a strain, so cords or steel rods should be used

The size of timber, which should be straight-grained pine, free from knots, varies somewhat according to the height of the trestles, but at all times they must be kept as light in weight as is practicable The treads of trestles are rather widely spaced and staggered so that there are varying heights upon which to put scaffold boards by using one side of the trestles or the other

The treads should be carefully mortised into the sides and two riveted tie-rods should be used on each side Cords, hinges, etc., should be examined at frequent intervals The top should be wide enough to just take two scaffold boards

For special purposes, such as upon staircases, or to extend the height of trestles, extensions to the legs can be fitted on the outside of the legs (Fig 27)

Fig 25 Steps are probably the most useful of all apparatus This well tried pattern still retains its popularity

Scaffold Boards

Scaffold boards should be very carefully selected as they have to stand up to considerable strain A too springy board is a danger, so also is a board full of knots and splits A good board should be of straight long-grained timber, tough, and fairly stiff, and definitely as light as practicable Fir or spruce is best Boards vary in thickness in different parts of the country, the average being $1\frac{1}{4}$ in thick and 9 to 11 in wide A 9-in board is the width most generally used There are regulations which govern the use of scaffold boards for certain purposes Boards of 22 ft have frequently been seen in use The practice of using two boards, one on top of the other, is a wise one, especially when the

span between trestles is over 10 ft Frequently, the ends of boards are bound with hoop iron This is bad it is liable to cause damage to furniture It is better to drill a hole 2 or 3 in from the end and insert a good dowel or a thin steel bolt the ends of which are let in below the surfaces of the sides Projecting bolts are liable to cause damage Scaffold boards must always be kept dry Men cannot work comfortably on wet boards They are liable also to be slippery and result in accidents If wet they are heavy A ton of boards might absorb a considerable weight of water if left in the open for a few days The transport load is thereby increased Dirty boards should never be taken upon a job

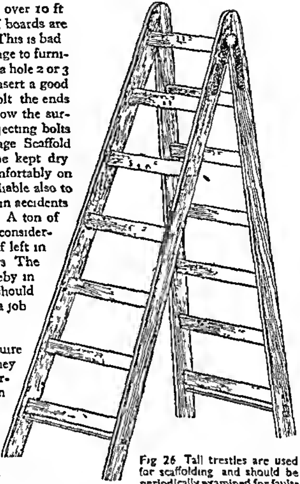


Fig 26 Tall trestles are used for scaffolding and should be periodically examined for faults and their safety factor carefully worked out and considered

Tall Ladders

Ladders also require careful selection They vary in length considerably, and increase in cost accordingly, the difference between a ladder of 50 to 60 rounds being twice that of a 20 round ladder per rung or round The sides are formed from the two halves of a fir pole They should be the two halves of the same pole or there will be a variation of spring It is better to select a pole of the right size than to have to reduce one The rungs are spaced 10 in apart Where heavy loads have to be carried as in some crafts the spacing is less

The rungs staves or rounds are of oak ash or hickory They should be carefully and truly fitted and properly wedged Loose rungs result in accidents Both sides and rungs should be as free from knots as possible At regular intervals of ten to twelve staves a ½ in iron ladder bolt should be inserted below the stave It should be riveted over on a washer Projecting bolts and nuts are liable to cause damage when ladders are laid on floors Further, any projection on which anything may get entangled should be avoided The substitution of a thick bolt for a stave or rung is undesirable The security of foothold varies and is not so good on

smooth, round iron as on the rougher wood of a rung

The width of ladders between the sides varies according to the length of ladder For general pur poses the most useful ladders are from 20 rounds to 40 or 45 rounds In the larger towns—London, Birmingham, Manchester—ladders are to be found which are over 60 rounds in length and sometimes 80

When using a ladder it is im portant to see it rests squarely at the top A damp surface is always slippery, so precautions should be taken accordingly If resting on a cornice external to a house, an arris board should be used to protect the edge of the cornice If resting on a surface which may be damaged the head may need muffling with a piece of cloth The slope of the

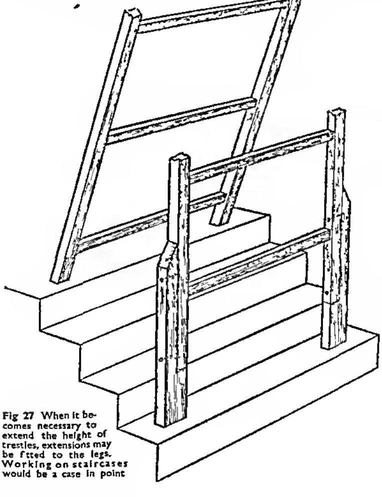


Fig 27 When it becomes necessary to extend the height of trestles, extensions may be fitted to the legs. Working on staircases would be a case in point

ladder when in position should be neither too straight nor too extended. If too straight the ladder may slip; if too extended it may not carry the weight It is unwise to proceed up a ladder two steps at a time: it imposes double the strain, and ladders will not always carry the extra strain with safety, consequently, accidents are liable to result The foot of the ladder should rest squarely upon the ground, which should be firm Should the ground slope, a wedge should be used and not a collection of bits of boards A ladder of fair length should be secured at the top by a rope to some secure fitment

Precautionary Measures

If necessary, especially in busy thoroughfares, the bottom of the ladder should be guarded No risks should be needlessly taken If ladders are to be left in a thoroughfare at night, a board should be placed and secured at the lower end of the ladder and the top securely tied A coat of white paint on the bottom end may prevent people running into the ladder in the dark A luminous disk has advantages

To raise a ladder, a man is required at the foot to stand on it with both feet while another raises the ladder by getting underneath and pushing it up Two men or more may be required to raise a ladder of, say, 40 rungs or over, and it may be necessary, if the ladder is really long, to have a rope for taking some of the weight in raising and lowering it A ladder of 60 rounds may bend considerably when one end is on the ground and the other being pushed up into the air A rope at the right place will take the strain if manned at the other

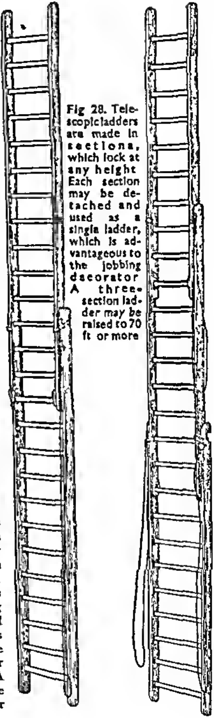


Fig 28. Telescopic ladders are made in sections, which lock at any height Each section may be detached and used as a single ladder, which is advantageous to the jobbing decorator A three-section ladder may be raised to 70 ft or more

end from a convenient window If a ladder is too short, two can be spliced together Good sash cord is required for this purpose, and there is a proper way to do it, although extension ladders have largely displaced the need for splicing

The telescopic ladder (Fig 28) has largely superseded the fir pole ladder, mainly because of adaptability and ease of transport. A well-designed type is simple in construction, compact, rigid, and strong and there should be nothing to go wrong if proper care is taken

These ladders are made in sections Those up to about 35 ft. and over are usually in two sections, and those of 48 ft and over in three sections Stout steel wire is rebated into the backs of the sides to give extra strength The wire is so strained into the sides as to cause a slight bow or camber in the ladder this counteracts the tendency of the ladder to curve inwards under weight.

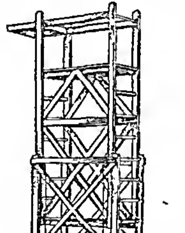


Fig 29 Tower telescopic ladders are obtainable in sections and complete with detachable wheeled bases

Great Adaptability

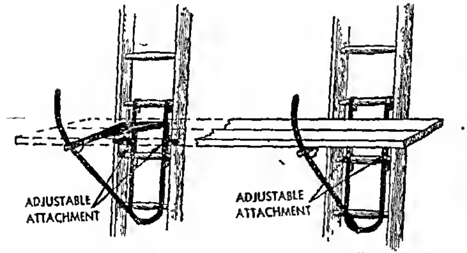
The sections of these ladders lock at any height. There should be no awkward fittings that are liable to get in the way and cause injury or accident

The sections are graduated in width to avoid top-heaviness, the middle or overlap is the strongest part, and they are so constructed that it is impossible to extend them to a height that does not allow sufficient margin of safety in the overlap of the sections The raising and lowering to the required height is by ropes and patent springless locks make it secure The ropes are of the best quality plaited hemp, and are pulled with one motion only The locks are automatic and adjust and release themselves as required

One advantage of the telescopic ladder is its great adaptability A section can be detached and used as one ladder, or a three-section ladder may be raised to 70 ft or more

The rungs, which are of birch, are mortised wedged and pinned into the sides and are generally oblong in section and therefore, not liable to turn like a loose round rung They are very strong and hard wearing

Various types of telescopic tower ladders are available in two, three,



LADDER BRACKETS FOR EXTERNAL WORK

Fig 30 These are used when it is necessary to erect a temporary form of scaffolding

and four sections, and are very adaptable They have a platform large enough to carry two men and a tool tray and are operated by hand ropes, and controlled by automatic locks They can be obtained with a detachable wheeled base (Fig 29)

Brackets and Travelling Cradles

Ladder brackets (Fig 30) are used primarily for external work, when it is desired to erect some form of temporary scaffolding which does not justify the use of poles, etc They are made of wrought-iron and hand forged, and the best types have few loose parts They are made to clip on to the inside or outside of the rungs of ladders and are used in pairs, that is, on two ladders, to support scaffold boards, there is room for two boards which may, according to their length, need to be "lined" Consideration must always be given to the load to be imposed because it has to be carried ultimately by the rungs of the ladder

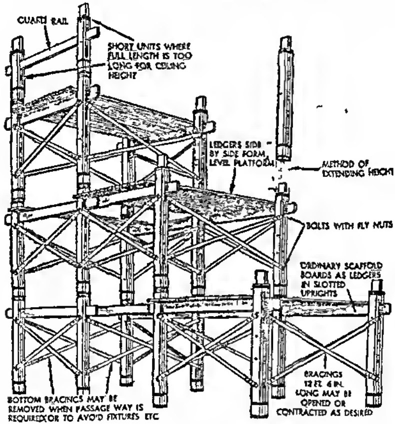
Cripples are somewhat similar in construction, but they are generally made of wood and fitted with hooks to clip into the ladder It is always better to select a type of ladder bracket or cripple which engages upon two rungs The platform of a cripple projects farther than that of a ladder bracket In large towns cripples are frequently used in the external painting of high buildings, several on each ladder, rendering it possible to gain access to the front of a building with fewer ladders

Generally, scaffold poles or light steel girders are fixed more or less horizontally on the roof and projecting several feet beyond the face of the building To these a track and travelling cradles are fitted so that they can move freely up and down and along the building frontage Once fitted and tested they require regular overhauling to ensure that all is safe

The decorator, especially if engaged upon large-scale work, often requires something more substantial than trestles and boards In addition, the nature of some jobs demands that a close boarded scaffolding must be erected so that

craftsmen can gain free access to large areas of ceilings and walls of such buildings as theatres, cinemas, and churches Such scaffolding may take one of various forms—a pole scaffolding, or one of tubular steel and ropes required and erect and maintain the structure while in use

There are also specialised schemes of scaffolding A good example of this is the Rap Rig, which is made of specially selected



RAP RIG SYSTEM OF SCAFFOLDING

Fig 31. Scheme of scaffolding which is arranged in units and fitted together to any reasonable height. The diagram lettering fully explains the method of erection

The latter has largely displaced the pole scaffold Whichever method is adopted, the job of erection is such that it should only be undertaken by those experienced in that type of work There are contractors who will supply all the poles, boards, timber This patent form of scaffolding is arranged in units, any number of which can be fitted together over any area and to any reasonable height The advantages are ease of erection, rigidity, and adaptability Fig 31 shows it in use

CHAPTER III

SURFACE TREATMENT

CAUSES AND PREVENTION OF DECAY TYPES OF SURFACES COMPOSITION OF PAINT FILM PREPARING A NEW SURFACE PRIMING PLASTERED SURFACES NEW WALLS STUCCO CEMENT ASBESTOS OR CEMENT SHEETING TREATMENT OF IRON-WORK PRIMING VEHICLES RUBBING DOWN STOPPING AND FILLING-UP TREATING PREVIOUSLY PAINTED SURFACES REMOVAL OF PAINT PRIMING SURFACES BUILDING A PAINT FILM TYPES OF FINISH VARNISHING AND ENAMELLING RE VARNISHING ECONOMICAL TREATMENT OF OLD SURFACES

As many building materials are liable to decay, the need for protective coverings constitutes the main reason for the application of paint This decay is not necessarily confined to exposed parts, it often develops in enclosed places as a result of unsuitable material or defective ventilation which could be corrected In all such cases, a more generous use of some simple preservative treatment might save much money and time

Cause of Accidents

Decay may take place in wood, iron stone, cement, and other materials Water seeping into cracks may freeze, the ice expand the crack widen, and then perhaps a piece of heavy material fall a considerable distance and injure someone below Proper painting will prevent many such accidents

There is a growing realisation of the importance of hygiene It is now appreciated that surfaces with which people frequently come into contact should be so treated that they are easy to clean This does not mean that all surfaces should be painted, far from it but every surface should be considered and the appropriate treatment applied

It is not always desirable to paint all parts of a room, those parts of a house where considerable condensation is likely to occur may become very damp if the whole of the interior surfaces are sealed with paint Decay may even be caused by water trickling down into the backs of skirtings (Fig 1) Ventilation will do much to prevent condensation, but sufficient ventilation for that purpose is not always possible or convenient Nevertheless, surfaces of rooms liable to much handling must be so treated that they are easy to clean, and such parts must be painted and finished with a high gloss hard drying paint

The character and condition of the surface to which paint is to be applied regulate the types of treatment necessary, and must always be carefully considered There are, however, other factors of almost equal importance The atmosphere in which paint is to be exposed will influence the selection of material, at least for the final coats

It is difficult to find a place where air is not polluted In industrial districts it may be heavily charged with sulphur and other chemical fumes whilst even the invigorating

atmosphere of the seaside is for most of the year overcharged with saline moisture harmful to paint

Light varies in intensity and these variations have an effect upon paint The colour of some pigments is adversely affected by strong light and some maybe by the absence of light

Heat affects paint In excess it can be disastrous If there is too little it may seriously retard the *drying of a paint film* The expansion and contraction of surfaces are regulated by heat.

Ideal Conditions

Generally a clean dry atmosphere of normal temperature is an ideal one in which to apply paint This is not always possible to obtain but much can be done by careful planning It is obviously inadvisable to apply paint during damp weather If rain seems probable external work should be postponed Similarly when it is foggy and there is a possibility of moisture being deposited upon the paint film work ought to be delayed or the durability of the film may be adversely affected In any case the gloss of the paint is almost certain to be spoiled and the drying may be seriously delayed

The foregoing is sufficient to indicate clearly that building up a paint film is not a job to be lightly undertaken Clients expect results such as are achieved only by those who have knowledge and skill and who work conscientiously Although it may seem easy for an amateur to obtain a passingly pleasing finish unskilled work often fails to stand the test of time and of the ever-changing climatic conditions of this country

There is tremendous variety in the types of surface to be treated Their purpose may be protective or decorative or a combination of both They may be exposed to rough usage or require to be cleaned at frequent intervals they may be internal or external They may consist of iron wood plaster cement stone composition board or any one of a combination of many other materials (Fig 2) They may be soft and absorbent or smooth and hard

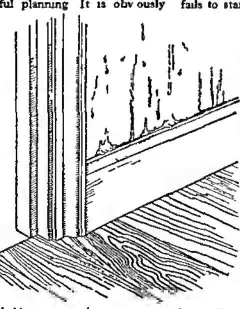


Fig 1 Illustrating condensation on painted walls This may percolate to the back of the skirting ends of floorboards etc. and cause timber to decay

surfaced They may be neutral to paint or consist of some material with which paint has no affinity Whatever the conditions no matter how favourable or otherwise most clients expect perfect jobs and are prepared to find fault if they fall below expectations Therefore the craftsman should always describe the result he believes he can achieve for a given sum and indicate how he intends to proceed with the work

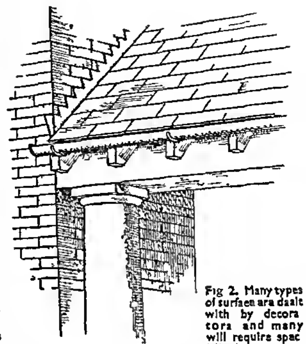


Fig 2. Many types of surfaces are dealt with by decorators and many will require specialised treatment

Surface treatment involves the application of various kinds of paint to various kinds of surfaces and includes all the necessary preparatory work.

The composition of paint is dealt with elsewhere study it with care It is fundamentally necessary that it be properly understood

Coats of Paint

Paint is the medium of the craftsman painter With it a film has to be established to cover various kinds of surfaces the final and complete film really consists of a series of films called coats of paint The first is attached to the surface by absorption or adhesive properties or by a combination of both The coats are combined to form a protective and decorative finish.

The fluidity of paint for each stage and purpose is important It must also have the right adhesive properties and should dry within the right period of time to form a complete film of the correct degree of hardness

The completed paint film consists of priming undercoatings and a finishing material The surface must be perfectly clean and the undercoatings attach themselves firmly to it and to one another and ultimately dry hard The final coat must also attach itself firmly and dry hard

The finishing coat has different functions to perform It must protect the undercoatings and in some circumstances must have good weather resisting properties The undercoating materials should also be durable although they serve other purposes as well For example in the first coat attachment is the important factor this is equally necessary in subsequent

Fig 3. Materials deteriorate when exposed to air

coats, obliteration is essential also The final coat may have to resist hard wear, or be able to withstand exposure to the elements

Therefore, pigments have to be selected for various purposes, in some instances durability is the requirement, and in others density or obscuring properties Colour is important at each stage of the work

Proper Spread

The efficiency of some materials or combinations of materials may be affected by the method of application Some types of paint require a well filled bristle brush to spread them properly, and they may not prove durable if they are not well brushed

All containers should be resealed immediately the quantity required has been taken out Many materials depreciate as a result of chemical and/or physical change if exposed to atmosphere Turpentine evaporates from an open bottle, oil oxidises, varnish thickens, prepared paints skin over Similarly, pigments ground in oil skin over and waste those ground in water or turpentine harden because of evaporation (Fig 3)

Many materials are liable to have a damaging effect upon health if handled negligently Turpentine has a bad effect upon sinews and skin it should never be used for the purpose of cleaning hands, oil is likely to cause dermatitis, a skin disease difficult to cure, lead may cause colic and lead poisoning, otherwise known as plumbism or dropped wrist The creation of lead dust by dry rubbing down lead-painted surfaces is prohibited if the Government regulations are observed, no lead dust will be created The careless use of abrasive material may result in the skin of the hands being cut through Eczema may result from a variety of causes, all associated with carelessness and neglect of reasonable precautions

Before applying paint to new surfaces, some preliminary work usually has to be done Defective timber should be replaced by sound wood and the surface made smooth and free from dirt and dust (Fig 4), a jamb brush is used for dusting it Often it will be found that the carpenter has rather too vigorously used glass or sand paper of a coarse grade diagonally across the grain, or in circles and has scratched the surface in such a manner that paint will not fill it up, this is sometimes done under the mistaken impression that it assists the paint to obtain a grip

Rubbing down should be carried out with No 1 or 1½ grade glue-bound glasspaper This should for preference, be wrapped round a cork block measuring about 2 by 3½ by 1 in in size Even better is a rubber block with its sides shaped

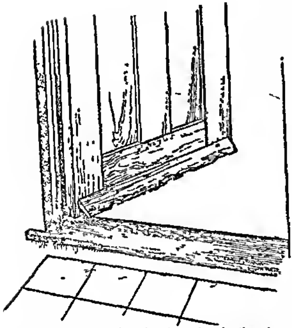


Fig 4 When unsound timber is replaced all surfaces must be primed before they are joined one with another

produce a fairly satisfactory result, but at best it is a subterfuge The same kind of treatment as for knots, indicated later, may prove satisfactory; it is difficult to generalise with safety in regard to faulty timber

Resinous timber also presents difficulties Here the treatment prescribed for knots is generally applicable, but it has been known to fail Some painters have tried covering the surface with brown paper fixed by paperhanger's paste, applied not too liberally,

to take an easy grip (Fig 5), and the rubbing should be in the direction of the grain

The shoulders of framed doors are sometimes badly finished, some shrinkage may have taken place, so that a part projects slightly (Fig 6) If this cannot conveniently be planed down it must be rubbed down for it will be more conspicuous after it has been painted, especially if this is done with a glossy paint Moulding too should be carefully rubbed down

Changing Colour

Sappy or badly seasoned wood is liable to cause a change in colour of paint, strictly speaking, such material should be removed and replaced by sound timber, but often this is impracticable Experience will best dictate the treatment to apply A preparatory coat of washable water paint or distemper may

and then painting it as for soft wood, but this again, is at best rather a makeshift

When nail heads project they should be punched well below the

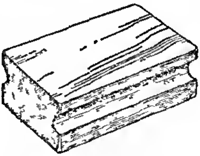


Fig 5 A shaped rubber block which provides an easy grip for rubbing down

surface, and stopping applied in the holes after priming (Fig 7).

Any loose knots should be removed and replaced by sound, well-fitted timber properly secured If possible both the aperture and the

by the knotting but must not press on the bottom of the bottle or they will be crippled. The knotting bottle should be kept clean and not allowed to get "gummed up." Methylated spirits evaporate quickly and, unless air is excluded, the knotting thickens. Such knotting dries more slowly, and often fails to harden satisfactorily.

Knotting should be thinly applied; two thin coats are much more satisfactory than one thick coat. It should not be allowed to spread beyond the area required; that is, about $\frac{1}{4}$ to $\frac{1}{8}$ in. around the knot. If just dabbed on, the edge will be thick and show through the paint, especially paint having a gloss finish. Knotting dries in a few minutes. The area treated will be different in character from the remaining surface: it will be hard, shiny, and non-absorbent. Oil paint will not dry hard enough on it and may not secure proper attachment; therefore, it is desirable to cover it with flat paint first.

Fig. 8. Knotting should be kept in a wide-mouthed bottle provided with an air-tight cork, or it is liable to thicken.

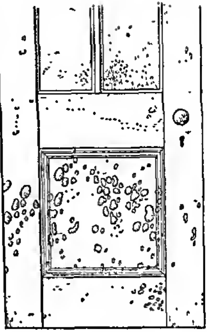


Fig. 9. Blistering is primarily caused by absorption of damp before painting.

Priming Coat

The priming coat is the first coat. It is the foundation of all subsequent operations. If it is faulty defects may follow and time and material will be wasted.

It should be applied to all parts which absorb moisture. The minimum of time should elapse between

its application and the further work

The composition of priming paints varies according to the type of surface to which they are to be applied; in all cases, however, certain fundamental requirements must be observed. The priming should be able to penetrate and secure proper attachment to the material, and to maintain that attachment when dry. It should resist the absorption of moisture and provide a suitable surface for the application of subsequent coats of paint. It should be so composed that it will conform to the various movements of the material resulting from changes of temperature and humidity. Incidentally, the material to be painted must be dry. Imprisoned moisture must find an exit, and this results in the detachment of the paint film, generally in the form of blisters (Fig. 9).

Best Ingredients

The test of time has proved that the best ingredients for priming for all general purposes are white and red lead, pure refined linseed oil and American turpentine or good quality turpentine substitute, conforming to British Standard Specification. The addition of a small quantity of benzine instead of turpentine is sometimes advised, but it should not be used to excess.

Flake aluminium and other flake pigments mixed with a varnish medium have been successfully employed for some years by firms who have given priming composition considerable attention. Others advocate the use of zinc oxide, titanium or lithopone, in oil media. It may be considered that as these pigments carry a greater oil content they are reinforced by that means.

Genuine English, Dutch-Stack process white lead ground in linseed oil is undoubtedly the best type of lead pigment. It should be well matured, for, within reason, the older it is the better. It should be combined with sufficient red lead to tint it a pale pink.

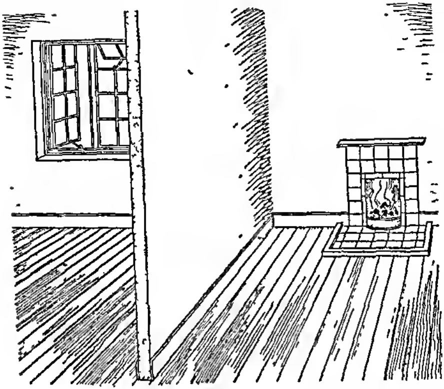
Standard Specification

For surfaces to be finished in light colours, a little less red lead will enable the white or light tints to establish solid, opaque films more easily. Generally, it is not advisable to add so much red lead that the colour is darker than pink blotting paper.

There is a British Standard Specification to which white and red lead should conform, and any variation from it must be suspect.

The mixture of red and white lead should be reduced to a reasonably fluid state with refined linseed oil, and then further thinned with genuine American turpentine or good turpentine substitute, and carefully strained. The final proportions should be approximately three to one. The inclusion of driers is not always necessary. The red lead acting also as a drier, is often sufficient.

Very resinous wood resists the absorption of priming composed of white and red lead. In such cases flake aluminium with a varnish medium and a small quantity of turpentine has proved reasonably successful. The oval ground brush, generally known as the pound brush, is the most efficient paint brush ever made. Its cost normally, however, is some three or four times that of a flat brush of the same width. Perhaps a false sense of economy is responsible for the fact that the ground brush is not



DECORATING NEWLY ERECTED WALLS

Fig 10 Partition walls must be dried out before any attempt is made to redecorate

often used now, yet its efficiency for paint spreading is beyond question It is significant that many specifications especially American, stipulate that priming paints must be applied with the pound brush and sash tool and no others The idea that any old brush is suitable for priming is founded on ignorance and inefficiency Proper tools skilfully used will secure a more efficient distribution and penetration and consequently a better attachment of priming The surface must be free from dust and the priming well spread Good distribution is of the utmost importance Therefore, it must not be applied hurriedly

Obviously hard woods are less absorbent and penetration and grip will be more difficult to secure, therefore the composition of the priming requires to be adjusted

Priming Coat

The principal alteration necessary is in the composition of the vehicle which should include more turpentine or turpentine substitute The proportion of red lead can with advantage be reduced As the film of paint contains more turpentine it will not be so thick and the spreading of the priming must be very thorough An excess of driers should be avoided

When the paint has been removed from old work the surface must be carefully rubbed down,

allowing ample time for the water to dry out, if any wet process is employed Care must be taken to remove particles of old paint from quirks, etc , and all knots must be coated with knotting, as even those in old work are liable to exude resin The priming should contain rather less red lead, and the proportions of turpentine and refined linseed oil be about 1 to 2 As the surface will probably be charged with oxidised linseed oil it will not be so absorbent

Ton of Water

The plastered surface of interior walls in a newly built house of average size has been computed to contain more than a ton of water Sealing such a wall with paint invites trouble Materials should be used which permit the emergence of moisture.

The decorator is sometimes called upon to redecorate after new partition walls have been erected (Fig 50) Brickwork or breeze blocks may have been used and plastered It has been found possible to paint such a wall successfully within two weeks of erection, a good fire having been kept in one room and the other side of the new partition exposed to air as freely as possible

The term plaster is employed rather loosely to describe a variety of materials used to cover brick walls, first with rough coats and then with fine coats Actually, comparatively little plaster is employed the principal material consists of slaked lime and sand and the surface is usually finished with a fine coat of lime and plaster of Paris or gypsum

Lime needs to stand for a fairly long period after slaking before it can be safely used If this rule is not observed it will contain tiny particles of unslaked lime, which will expand when moisture reaches them, causing the plaster to be lifted in blister like patches This may not occur until weeks or months after the surface has been finished Hydrated lime is now frequently used, as it is not so liable to ' blow "

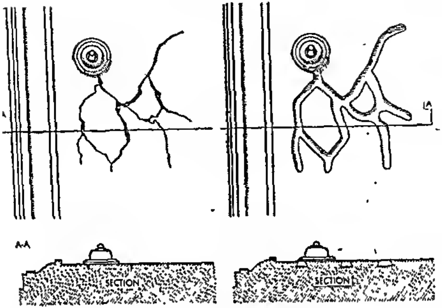
Lime and paint do not mix Lime, when active, will quickly destroy any normal paint film, for the linseed oil in it is saponified by the alkaline action of the lime

New walls and ceilings should be left until it is reasonably certain that the plaster no longer has more than the normal atmospheric moisture content Alternatively, the walls and ceilings can be left as long as possible, and then painted with washable water paint or distemper of a colour indicated by the manufacturer as safe on new plaster, or with size-bound distemper

Non-Aqueous Material

A third method, when the walls are reasonably dry, is to apply a flat oil paint in accordance with the manufacturer s instructions This paint consists of non aqueous material and dries flat, that is, without any gloss It should be non-waxy, or difficulties will be encountered when repainting is attempted The type of flat oil paint selected must be one that does not interfere unduly with the porosity of the surface Moreover, it should form a suitable foundation for further treatment Its cost is rather higher than that of washable water paint and distemper

Flat oil paints should be applied with paint brushes and not as is sometimes the practice, with



CAREFULLY FILLING IN DEFECTS

Fig. 11. Cracks which develop must be raked out and, with other defects, repaired.

distemper brushes. Though these paints have a certain amount of "flow," reasonable care with the brushwork should be observed.

For walls which are new but have been allowed to dry, there are paints prepared by manufacturers in which the binder is an oil much less vulnerable to slightly active lime.

However, the newly plastered surfaces may have developed a few defects. These may be only slight, but they must be repaired. All the cracks, except the purely surface ones, must be raked out and then carefully filled in (Fig. 11).

The experienced craftsman adds a small quantity of washable water paint or distemper to his plaster of Paris to retard the setting, and to give him more time to handle the material.

A true and smooth finish is essential in all repairs. The surface must be lightly rubbed down with No. 1 glasspaper, and then dusted carefully. The general instruction as to the protection of floors, etc., should always be observed.

Adding Driers

The plastered surfaces may now be primed. The most suitable priming paint for new walls is similar to that used for soft woods or absorbent surfaces, unless the plaster has been so highly trowelled that a non-absorbent condition has been created. In this case the vehicle should contain equal quantities of oil and turpentine; the increase in turpentine will assist penetration. Drier must be added. If a standard patent drier is used, about 1 oz. to the lb. of paint will be ample. It must never be forgotten that the red and white lead have powerful drying actions.

Many craftsmen are indifferent with their brushwork on a job of this kind. Most of the priming

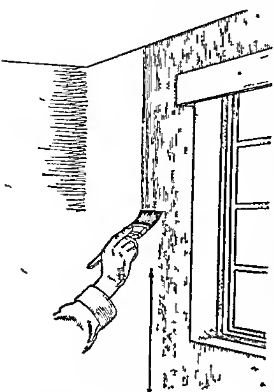


Fig 12. Laying off should be done vertically from the ceiling to the floor when painting walls

sawn and fitted where required Since it is precast time can be allowed for it to become comparatively dry therefore it can be painted almost immediately after fixing It is fairly soft and absorbent The most suitable priming is one consisting almost entirely of oil many painters use nothing else but boiled oil for such jobs but it is improved by the addition of a paste drier Such a mixture hardens the face of the material which may then be painted just like any other plastered surface which has been primed

A surface finished with Portland cement often presents a particularly difficult problem to the painter Cheap cement and dirty or loamy sand will create painting problems which cannot be anticipated before the work actually commences Good cement and clean sharp sand on the other hand make the problem easier Every painter knows that undried paint on his hands and clothing can generally be removed by washing it with a strongly alkaline soap It is therefore easy to understand that if paint is applied to any strongly alkaline material this within a short time will soften the oil In fact if sufficient moisture is available to render the alkaline material

paint will be absorbed and this may cause the painter to under estimate the importance of brush work The priming must be applied with reasonable liberality and be well spread The laying off should be vertical that is from ceiling to floor (Fig 12) on walls and parallel with the main source of light on ceilings (Fig 13) and be carried out with the greatest of care

Fibre and Plaster

Fibrous plaster is a mixture of fibre and plaster on a fibrous backing Mouldings and ornamental work are cast in this material and

appreciably active, it converts it to a soap In new Portland cement finishes, the alkaline content remains active for a long time Such surfaces should not be painted until twelve months have elapsed, instances have been known when painting has failed after the surface has weathered for several years

A treatment which has met with some success, but which cannot always be guaranteed, is to endeavour to neutralise the alkaline content of the cement The application of a 50 per cent solution of zinc sulphate and water is sometimes effective Success depends upon the degree of penetration The treatment should be applied as soon as the cement is hard and dry A period must then be allowed for the water to dry out before painting can proceed

Soft and Greasy

It has been indicated that the alkaline content of Portland cement tends to cause ordinary paint to become a soft greasy soap However, there are oils which are not so easily affected, and some manufacturers prepare special paints using these less saponifiable oils

It is important to follow any instructions available, for these may vary according to the manufacture of the paint After cement finished surfaces have received one or two coats of special cement paint, the ordinary procedure of painting can usually be adopted It may, however, be wise to complete the job in hand with material manufactured by the same firm

Stucco Cement

The problem of stucco cement is similar to that of painting cement-finished surfaces, but as there is less

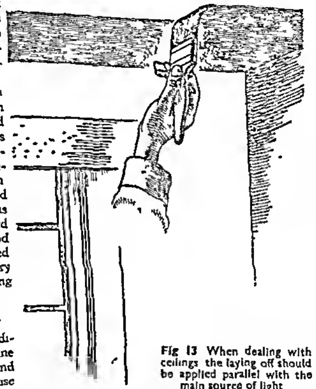


Fig 13 When dealing with ceilings the laying off should be applied parallel with the main source of light

cement in this material washing the surface with a 10 to 15 per cent solution of zinc sulphate will normally be fairly effective in neutralising the alkaline matter The special paints already referred to may also be used It is frequently the practice, however, to finish such surfaces with washable water paint or washable distemper

Normally, size should not be

used on surfaces of asbestos or cement to be painted Cement sheeting fixed inside a building may provide an exception to this rule

Parian and Keene's cement finishes should be painted as soon as the material is hard enough to stand the friction of the brush without disturbing the surface A few hours' delay may allow free salts to come to the surface and render painting impracticable

The paint should consist of white lead in a vehicle nearly all turpentine Paint should be applied freely and then left to dry Days, or even weeks may elapse before further work can be done Much of the paint will then have disappeared, but a surface will be left comparable to a normal plastered finish

Failure to Grip

Sometimes the plasterer will trowel the surface to a marble like hardness on which paint may fail to secure a grip Following the period after application of the turpentine priming coat, success may generally be attained by using a good oil varnish with turpentine as the vehicle for a first coat of paint. It has better adhesive properties

New iron-work is sometimes received entirely without paint, and, therefore, may be rusty in places The rust should be removed by means of wire brushes and paraffin (Fig 14) It may be necessary to complete operations with an abrasive paper and paraffin

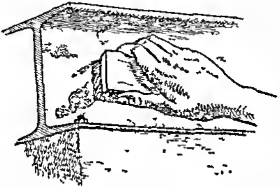


Fig 14. Before it is painted rust must be removed from new iron work by means of wire brushes and paraffin

Apart from rust, iron-work may have a coating of scale consisting of minute flakes of iron If this is not removed, it will become detached later and will carry with it any paint which may have been applied The removal of a scale normally requires a wire brush and much hard work, although there is a variety of mechanical brushes available

Frequently a coating of paint is applied at the foundry A rigid specification is necessary for the composition and application of this foundry coat, which otherwise should be removed before further paint is applied Careful examination and experience must dictate what is best to do A characteristic red or grey colour is no guarantee that the foundry coat is reliable, more frequently it is not

If the surface has been cleaned with wire brushes, abrasive paper, and paraffin, the resulting sludge should be removed Paraffin need not be entirely removed, if the paint subsequently applied is well spread

Any rust imprisoned by paint may develop beneath the paint film

for a long time before that film is dislodged and the surface exposed Therefore, in ensuring proper contact between the paint and the iron, the most minute parts must not be overlooked Negligent preparation of iron work before painting may result in deterioration of vital parts and weakening of the structure

Preventing Rust

The selection of pigment for a suitable priming paint is important Some pigments have inhibitive properties, that is, they prevent the formation of rust The best known of these are red lead, white lead, lead chromates, zinc, and zinc dust The chrome pigments may be considered expensive, but in view of the importance of the problem and the small cost of paint relative to the total cost of painting, the extra outlay on material is generally justified

Red lead is the best pigment for application in industrial districts, but it must be well protected by further material, from the damaging effect of the atmosphere Chromates are not so good, except in rural and marine atmospheres Red lead is an efficient primer, with good drying action in combination with linseed oil A small addition of red oxide of iron prevents the paint from becoming excessively hard while the addition of 5 per cent of paraffin wax imparts a measure of elasticity to the priming

Priming Vehicle

Pure refined linseed oil and American turpentine, to the proportion of three to one, form the best vehicle for priming No drier is required for red lead priming, red lead itself being a drying agent The priming should be of the right degree of fluidity, if it is too thin, the surface will not be effectively sealed if too thick, the film may become too hard, and scale

Priming is applied by brushing and spraying, or by a combination of the two There are Government regulations which must be observed relating to spraying lead paint Generally, brush application is preferable, and in many specifications it is stipulated that all priming must be applied with a round or oval brush, as this ensures a better spread of the material and better contact Flat brushes are unsuitable, as they do little more than lay the paint upon the surface

Spraying Twice

For spraying, the priming should be more fluid than for brushwork Since less pigment is deposited, twice spraying the priming may ensure that an equal body of pigment is used, but because the quantity of oil is higher the correct balance is difficult to obtain Moreover, with the spray it may be difficult to secure uniformity of thickness of paint film

Galvanised iron should be exposed to the weather for a period before painting If this is impossible, the surface may be washed with a solution of copper sulphate and allowed to dry An adhesive and sticky paint should then be used The addition to the first coat of paint or varnish or good quality japanner s gold size will ensure this If the colour is suitable, red iron oxide is a good pigment

Bituminous paints and prepared tar are also recommended for the treatment of galvanised iron when conditions are suitable and colour unimportant There is no advantage in applying red-lead priming

unless the galvanised iron has been so long exposed that the zinc face has perished and iron is laid bare, when the procedure is similar to that for painting iron

All surfaces which have been previously painted should be rubbed down Surfaces which have been primed require rubbing down to ensure they they shall be made as smooth as possible, and that any particles which have become detached are removed

Clean Surfaces

Surfaces of old paint must be washed and rubbed down in order to make them smooth and clean, and suitable for the application of fresh coats of paint The regulations governing the use of lead paint deal with this matter and include instructions for testing a surface to discover whether lead paint has been applied to it. Unless such a test is made it must be assumed that lead paint has been used

Surfaces treated with lead priming must be rubbed down by a wet or damp process to prevent the creation of dust. Dry rubbing creates dust which may contain lead, which is poisonous, and is liable to pollute the atmosphere Surfaces must be thoroughly dry before further paint is applied

Materials used for rubbing down are glue-bound glass-, flint-, or sand-paper, waterproof abrasive paper, pumice stone powdered pumice stone and cuttlefish The cuttlefish is used for special purposes, and obviously has limited application A good sponge, chamois or wash-leather, and rubbing block are required for wet rubbing down

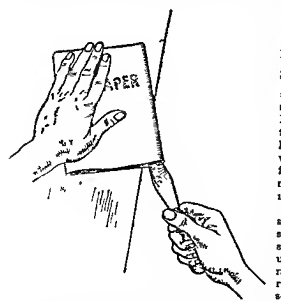


Fig 15. Glasspaper must be cut to convenient sizes as required and not just indiscriminately folded and torn

Sand,- glass-, and flint-paper are graded in sizes indicating the degree of fineness Nos 1 and 1½ are the grades in general use This abrasive paper should be stored in a moderately dry place If the temperature is too high the glue will harden and the paper will crack when folded, so a slight measure of humidity is an advantage

Glue-bound abrasive paper is used for smoothing unpainted surfaces and may be used where there is no lead paint The right grade should be selected for each purpose A too coarse material scratches the

surface and necessitates more work in rubbing out the scratches Unpainted wood surfaces should not be rubbed too vigorously Rubbing should be in the direction of the grain not diagonally across it or in circles Diagonal and circular rubbing often result in scratches

Cutting Glasspaper

Glasspaper should be cut to the proper size, not folded and torn (Fig 15) Cutting ensures that the edge is slightly bevelled, tearing causes an angular formation along the edge which is liable to cause scratching The size most suitable is obtained by folding double along the short side of the sheet or, for smaller work dividing the sheet into three pieces

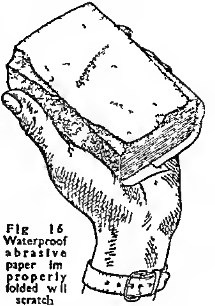


Fig 16 Waterproof abrasive paper improperly folded will scratch

It is not wise merely to hold glasspaper in the palm of the hand This results in surface contact of only those parts touching the hand It is better to use a rubbing block of a size about half or a third the length of a sheet of glasspaper, $3\frac{1}{2}$ in long 2 in wide by 1 in thick is a useful size The block may be of wood of wood faced with cork or felt, or entirely of cork A very efficient block is of rubber with the edge moulded so that the fingers may easily grip the paper The slight pressure of the fingers into the moulded shape ensures that the paper is kept tight on the face of the block, while the fingers do not get tired so quickly Dust should be removed with a dust or jamb brush

The same type of block should be used with a waterproof abrasive paper This consists of a carborundum like material attached to a waterproofed paper by a waterproof adhesive The grades of paper are numbered the numbers varying according to manufacture The abrasive material is very hard and the paper if properly taken care of, has a long life After use it can be cleaned, dried and put away ready for another occasion It can be folded to the shape of the moulded block Though relatively expensive to buy, it is economical in practice if properly looked after It should be stored in a slightly damp atmosphere In too dry an atmosphere it will crack when folded (Fig 16)

The surface to be rubbed is damped by means of a sponge and water and then rubbed generally in the direction of the grain of the wood or in that of the brushwork When rubbing down is completed the surface should be well washed to remove particles of material and dried with a wash leather

Pumice Stone

Pumice stone is thrown up by volcanic eruption, it is light and porous The best for the present purpose is Italian It varies considerably according to the extent to

which it has been burnt. Some pieces are heavy, gritty, and hard. The most suitable quality is soft, porous, and light. It is used for rubbing down old, previously painted surfaces prior to repainting. If a surfare is dirty, sugar soap or soda must be added to the water, or the surface washed with sugar soap or soda water before rubbing down. The soap or soda water must be completely washed off with clean water.

The stone should be cut to a suitable size with a hack-saw. It should be faced; that is, a smooth face should be obtained on one side by rubbing the dry pumire stone upon a piece of ordinary stone, such as York stone. The face thus formed is the cutting or rubbing fare. The pumice stone should be squared; that is, two sides and edges of the face should be rubbed straight and form rather less than a right angle with each other

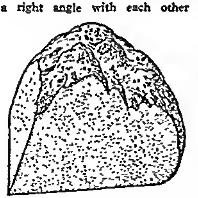


Fig. 17. Italian pumice stone, shaped as illustrated, is used for rubbing down.

(Fig. 17). This makes it possible to rub with the stone into the angles of panels. The cutting face must be kept clean by occasional rubbing against another piece of pumice stone or on a piece of York stone; a doorstep is frequently used. This is an objectionable practice. If the edges of the pumice stone wear thin they are liable to break off in bits, get under the face and scratch the surface to which they are being applied.

Pumice-stone blocks consist of normal pumice stone reduced to powder, and mixed with a suitable binding material. This is then cast into blocks which can be cut to the size required.

The surface of the paint should be damped and the face of the stone just dipped in water. The rubbing is by a straight motion in the direction of normal brushwork on each part of the surfare. The stone should not be immersed entirely in water; because of its roughness it will rub the skin from the fingers. In a few hours the fingers will be too sore to hold a piece of pumire stone for some days. The surface should be wiped occasionally with a wet sponge to remove the mixture of paint and pumice stone worn away by friction, and finally well washed with clean water and dried with a wash-leather. Water must be prevented from getting into cracks and the backs of loose mouldings, and from accumulating upon the floor. The pumice stone should be cleaned and put away after use, and the sponge and leather well washed.

Varnished Surfaces

Powdered pumice stone is used for rubbing down varnished or enamelled surfaces before re-varnishing and re-enamelling. The powder is held on a felt pad, the surface then damped and carefully rubbed. This removes or reduces the gloss. Defective parts may be touched up and the surface then

re-varnished or re-enamelled

Cuttle-fish is of fossil-like appearance, and found on various coasts The hard back of the cuttle-fish must first be removed with a sharp knife, then cut into suitable shapes and sizes according to the surface upon which it is to be used The fish is soft and quickly rubs away The edges must be squared, or bits may break off, work under the rubbing face and so cause scratches

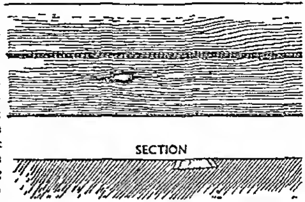


Fig 18. Stopping is liable to shrinkage if the priming has not been well and truly brushed into the nail holes

Cuttle-fish is used for rubbing down hard varnished or enamelled surfaces before re-enamelling and re-varnishing, and as a preliminary to polishing varnished surfaces The lubricant used with it is water

Polishing Action

Putty powder, which is poisonous, is used with a non drying oil, such as olive oil, as a lubricant It has a polishing action and is used when it is desired to polish a varnished or enamelled surface The hand or, preferably, a felt pad is used to apply the friction Patience is the main requirement for successful polishing

Nail holes and cracks need filling up with a suitable material This is generally done after the surface has received one coat of paint For new woodwork the priming should be brushed well into all nail holes and cracks, and the nail heads punched well below the surface If the nail heads have been missed in the priming they are liable to become rusty This rust may prevent attachment of the stopping Another cause of loose stopping is that priming is not brushed into nail holes Consequently the oil from the stopping is absorbed into adjacent woodwork and the stopping shrinks (Fig 18)

Stopping is generally done with linseed oil putty This consists of dry powdered whiting and pure linseed oil, thoroughly mixed together and well milled Damp whiting and inferior oil should be avoided, for cheap putty is expensive in the long run Fish oil and similar oils should not find a place in putty to be used for stopping, since they prevent its hardening

Applying Putty

Putty should be applied carefully with a putty knife This should be of good steel, not rigid but pliable It is pointed, with a straight or skewed facing edge Putty is applied with it in small quantities and fed into the hole It is useless to put a lump of putty on the end of the knife and press it over the hole Air will be imprisoned, so that the putty cannot enter and fill the hole The putty will then become loose

more filling A careful examination of the surface after rubbing down will quickly show where more attention is required A high gloss finish will show up all irregularities of surface much more than a flat or glossless one, therefore, if the finish is to be full gloss, the preparatory work must be executed with considerable care

Distemper Filling

Whiting and size, to which may be added a little fine plaster of Paris, such as dental plaster, are sometimes used for filling purposes The whiting must be fine and dry, and the size, when cold, about the consistency of table jelly Too much plaster will make rubbing down difficult, and size which is too strong may cause cracking An excess of plaster may cause cracking and chipping

Distemper filling has been used extensively and successfully When applying it to mouldings a brush should be used No other tool will give satisfaction Care must be taken not to fill quirks, but rather to get the filling where it is really wanted An advantage of distemper filling is that it dries rapidly A disadvantage is that unless the ingredients are properly proportioned it may crack If allowed to collect in the angle formed by the edge of the stile and the bed of the panel in framed structures, it may crack as a result of slight shrinkage of the panel or stile

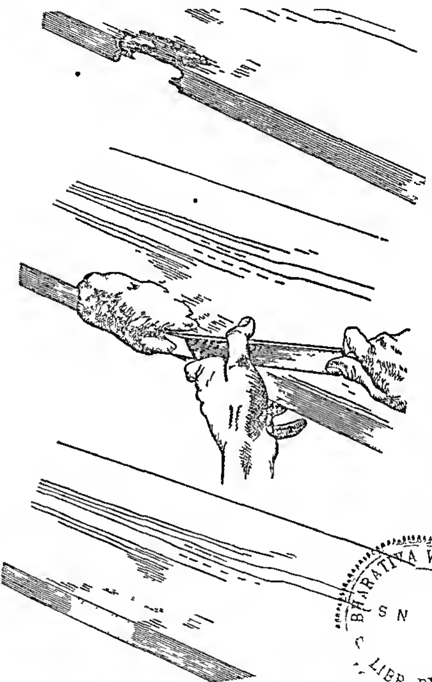
It can be rubbed down to almost any shape with glasspaper and is useful for making up shapes which have been damaged Glue-bound glasspaper No 1 or 1½ should be used Some dust is made when this is done, and the dust must be carefully removed, as it is light and easily distributed unless cleaned up with care

The surface must now receive a coat of glaze, and some parts may require two coats, these parts will be indicated by the complete absorption of the glaze. The latter should be made with japanner's gold-size or elastic oak varnish and turpentine in about equal quantities Some prefer to use paint in which there is only a small percentage of oil, but glaze is better

Manufacturers prepare hard filling in cream and grey The grey is composed primarily of ground slate, japanner's gold-size and turpentine The cream is a composite material, consisting of barytes, whiting, and some white lead with japanner's gold-size and turpentine. Both fillings are thick and creamy in consistency, and should be applied with a filling knife. They may be thinned and applied with a brush to the mouldings When dry and hard they must be rubbed down with waterproof abrasive paper or pumice stone and painted following the sequence for painting on previously painted surfaces. For thinning use turpentine, or special thinner, in accordance with the manufacturer's instructions.

Addition of Whiting

Water paint and washable distemper are sometimes used for filling and are especially useful for wall surfaces The thick paste water paint is stiffened by the addition of whiting and applied with the filling knife or made less stiff by the addition of petrifying liquid or water, according to the manufacturer's instructions It may be applied to mouldings with a brush It does not rub down so



REPAIRED WITH PLASTIC WOOD

Fig 21 After hardening plastic wood can be chiselled to any desired shape

clean water and then with acetic acid or vinegar, diluted according to the strength of the caustic material which has been used and which is to be neutralised A 50 per cent solution is generally suitable If strong acid is not completely removed it will cause trouble later

Chemical solvents are used They

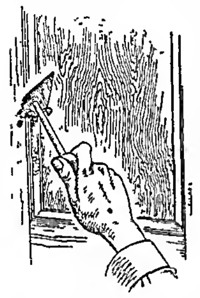


Fig 23 Shave-hooks are used for *scraping the soft paint from mouldings.*

consist of highly volatile solvents with wax to delay evaporation. They are generally very inflammable and require great caution in use There are however, non-inflammable types

The wax sometimes present in chemical paint removers if not properly washed off will prevent paint from drying Therefore, when all the softened paint is removed surfaces must be well washed with turpentine or turpentine substitute to remove the wax or there are wax-free types of chemical solvent

When old paint is to be stripped off, the surface must be coated with the caustic solution or chemical paint remover and kept wet. The action of caustic removers is to saponify the oil, that is to turn it into a soap The surface must be kept wet, if allowed to dry, the partially softened paint will be difficult to re soften When soft, the paint is removed from the flat surfaces with a scraper, which is similar in pattern to a filling knife but not quite so pliable. The scraper is used with a forward movement and the paint pushed in front of the knife A shave-hook is used to scrape the soft paint from mouldings Shave hooks are pear shaped or of universal pattern Care must be taken both with scraper and shave-hook to preserve the original shape of the wood, especially of sections of mouldings Quirks must be carefully cleaned out (Fig 23)

Collecting Waste

The softened paint should be put into a suitable receptacle and not allowed to collect upon the floor, where it may do considerable damage Floors may be protected by laying down thin boards sail cloth or sawdust. Water is liable to collect under boards or waterproof sheeting sawdust is liable to get secreted under skirtings The use of solvents often involves considerable mess, but is practically unavoidable for removing paint from a plaster surface as the application of heat causes the plaster to lift from the surface and crack The removal of paint by heat is the cleanest and easiest way of removing it Heat can be applied in

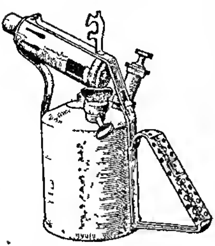
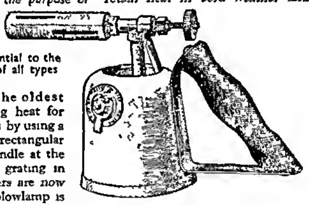


Fig 24 Selection of typical blowlamps *used by painters for the purpose of* stripping paint from woodwork Regulation of heat and flame protection are features that are essential to the successful operation of all types

several ways The oldest method of applying heat for burning off paint is by using a charcoal brazier a rectangular iron box with a handle at the back and an iron grating in front These braziers are now rarely seen The blowlamp is generally used nowadays but the heat must be carefully controlled Too much will bake the paint and probably burn the wood too little may necessitate a too vigorous use of the scraper, with the knife penetrating the woodwork and damaging the surface

There are good patterns of English blowlamps varying in design and fuel used (Fig 24) Some burn paraffin others benzoline or petrol Some have a pump attached which may either be self-acting or require to be operated by hand, some have wind shields as part of the lamp, whilst others have removable wind shields These shields are necessary in order to retain heat in cold weather and



protect the flame from wind The method of lighting varies, but generally there is a small reservoir, which may be either self filling or hand filled The paraffin or spirit in the reservoir is first lighted to heat the lamp This quickly causes the generation of gas A valve is then opened and this is the source of the blowlamp flame The pump increases the pressure and intensifies the heat If the valve is opened too soon a squirt of spirit may be ejected and possibly cause fire The flame is conducted through a nozzle and is thus easy to localise and direct on to the work,

but the flame must be kept away from bare wood, which, if resinous, quickly chars It is better to start from the bottom of each part from which paint is to be removed, thus the surface above is protected from charring by the paint upon the surface.

A scraper is used for removing the soft paint, which is pushed in front of the knife If allowed to collect in too large a quantity it may fall upon the hand and cause a serious burn, especially when the surface has been varnished several times The soft resinous paint and varnish sticks wherever it falls The shave-hook is, of course, used for removing paint, when soft, from mouldings

A useful tool is the Primus paint-stripper, which applies the principle of radiant heat The fuel is petrol (Fig 25)

The removal of paint should be complete and thorough Paint which has been subjected to heat and not removed has lost its elasticity and may cause defects later

Scraped-off paint should not be left lying about, as it treads into a fine powder

Surfaces adjacent to those from which paint is to be removed may be protected by holding in position a piece of flat sheet metal to which a handle has been attached (Fig 26) The straight edge of the scraper may be used for small parts but too much heat destroys the temper of steel Glass will not stand much heat, and must be protected.

The acetylene torch is made of a long metal tube with burners of various shapes, easily removable and changed The torch is attached to an acetylene and oxygen cylinder by means of rubber tubes, and the gas is controlled by a tap Considerable heat is developed

This torch is very useful for big jobs, but for small work the availability of acetylene and oxygen imposes limitations An ordinary gas burner with a short metal tube to which a burner is attached can be used in cases of emergency through a rubber tube from a nearby gas jet A Bunsen burner, if available is better still (Fig 27)

APPLIES THE PRINCIPLE OF RADIANT HEAT

Fig 25. This Primus paint-stripper is of novel shape and design and works well

Resinous Matter

It will be noticed that when heat is applied to a knot, resinous matter exudes There is no disadvantage in this, in fact, excessively resinous patches of wood may be heated in this way and some of the resin removed

When the removal of paint has been completed from a soft-wood surface, it must be carefully and thoroughly rubbed down with glasspaper and dusted off The knots should be knotted

Although the old paint has been removed, this will not have destroyed the oil absorbed when the surface was originally primed, and

absorption will, therefore, be less and suction reduced The pmportion of the vehicle must be modified to about equal quantities of oil and turpentine, the extra turpentine assisting penetration A little extra red lead may also be used with white lead, drier will not be required The priming must be well brushed in For hard wood the red lead content must be reduced, and it may be found to be desirable slightly to increase the proportion of turpentine

Preventing Rust

Where paint has been removed from iron-work by the application of heat, it requires rubbing down to remove particles of burnt paint If the paint has been removed by using caustic soda, no soda or moisture must be left in any joints if sealed it might cause rust to develop Should there have been a lapse of time since stripping off the paint, all rust which may have developed must be removed The priming paint should consist of red lead, etc., as recommended for new iron-work

A complete film of paint consists of a number of films of varying material, each having a function to perform They must be securely attached to each other to compose the complete film This film may have a decorative finish or one of great weather resisting properties or it may combine both qualities, neither of which need be sacrificed to the other

Certain pigments, such as lead, absorb about 8 per cent of oil in grinding, while others absorb twice as much, or even more This must be taken into account when deciding the proportion of oil and turpentine, the constituents of the vehicle The activity or otherwise of the pigment in relation to the drying or oxidising of the vehicle must also be borne in mind Lead is very active as a drier Titanium is inactive, it renders no assistance to the oil in drying and absorbs twice as much oil in grinding Hence the proportion of added oil for a full gloss paint with titanium as the chief pigment may be less than for lead The liability of *titanium to chalk must be remembered*

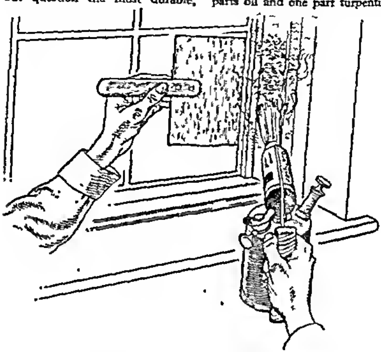
Some pigments, such as titanium and lithopone, are much denser than others They find their place in an undercoating because of their great obscuring properties Some may be used in finishing paints because they weather well and keep their colour Lead, for example, weathers extraordinarily well, but does not behave satisfactorily in a town atmosphere For protective purposes, therefore, in external work, lead may be essential for an undercoating The density of paint made primarily of lead for protective reasons may be improved by the addition of a percentage of titanium

Chalks Badly

Similarly, because titanium is unaffected by town air, it is very useful for the making of finishing paints, although it chalks badly This may sometimes be an advantage, for although it goes on chalking for a long time, there always seems to be plenty of pigment left Chalking, however, is reduced if a percentage of white lead is used, and these two pigments make a good paint for external use Heavier bodied oils than linseed should be used in titanium paints for finishing Stand oil and polymerised oil

are used in manufacturing such paints, and have proved very successful.

Different craftsmen vary the composition of paint applied in building the composite film The coach painter, whose work is without question the most durable, uses glaze for special purposes, such as binding distemper filling, and in decorative work. Some decorators build their film by alternate coats of paint, one containing about three parts turpentine to one part oil, and the next three parts oil and one part turpentine



FOR USE IN PROTECTING WOODWORK

Fig 26. When it is necessary to strip paint from small areas surrounded by material it is desirable to protect, a piece of flat metal may be held in position as a guard

primes his surface and fills it, then applies alternate coats of comparatively flat paint and glazes, the latter consisting of varnish and turpentine, well rubbing it down between each coat He repeats the process, adds a final coat of varnish, and produces a result which stands up to the most severe tests

The house decorator incorporates oil with each coat and only Others start with a paint consisting largely of turpentine, gradually increasing the proportion of the oil Each may be equally successful.

For external work the sharp coat may crack; the oil coat is more liable to blister on the sunny side of a building.

Manufacturers prepare undercoatings Generally they are flat paints, or comparatively flat. If

surfaces are painted with these materials continuously, they are liable to craze, crack, and flake An intervening oil coat may reduce the risk

For all general purposes, especially for preservation of the fabric by external painting, the most durable and weather-resisting films are built up by using more oil Building up with sharp paint is more suitable for internal work

In addition to washing and rubbing down, all loose material must be taken away when painting upon surfaces from which previous *paint has not been removed If the* previous finish has been full gloss oil or varnish, much of the gloss will have been removed by the *action of the pumice stone or water*-proof abrasive paper

Fig 27. Burning off paint by the use of a Bunsen burner which has been attached to a near by gas fitting

Correct Mixture

The *first coat of paint* should consist of not less than three parts of turpentine to one part of oil and the necessary pigment, such as lead and coloured pigment for tinting It should be comparatively thin and well spread The turpentine will help to secure attachment, the oil content providing the essential adhesive property This should be followed by a paint consisting of *three parts oil and one part tur*-pentine If lead is employed some titanium may be used with it to increase its obliterating properties Driers should be in proportion Any stopping or filling must be applied prior to application of this coat

If titanium is used, the propor-tion of driers should be slightly increased, as it is an oil coat, only a small percentage of driers is required in a paint consisting mainly of turpentine, there being less oil to dry If the finish is to be full gloss oil in four coats, the next coat will be a sharp coat followed by the oil coat finishing material

Few jobs, however, get four coats of paint, which form the ideal for work of this kind To finish in three coats, the oil content of the second coat must be reduced considerably, since it is unwise to apply one oil coat upon another The variation between the two formulæ of paint, sharp and oil, must be neither too wide nor yet too close

Each coat of paint should be applied at the right time Sharp paint dries more quickly than oil paint, so after applying an oil coat a slightly longer time for drying may be necessary, but if the period is too long there will be a loss of *cohesion between the various appli*-cations

The formulation of paint must vary according to the situation and nature of each kind of surface and its previous treatment The proportion of driers is regulated

largely by the amount of oil used in each application

If the previous finish has been flat or with little gloss, the first coat of paint should contain more oil Three parts of oil to one of turpentine will be satisfactory, varied according to the number of coats In a three-coat scheme, equal quantities of oil and turpentine should be used, always with the appropriate basic pigment and stainer or coloured pigment This will be regulated by the colour of the surface being painted and by the colour of the finish to be obtained If there is to be a change in colour, that of the new finish should be approached as quickly as possible The colour of the paint forming the ground upon which the finishing paint is to be applied should be approximately that of the finishing colour, or so close that the obliteration will be complete and a full and even-coloured finish obtained

The life of any material with which a surface is finished depends largely upon the previous finish and the preparatory work upon it

Proportion Varies

Different pigments or mixtures of pigments are suitable for different purposes, and the proportion of vehicle varies for each stage and process

For each type of finish there is a suitable ground coat and certain rules must always be observed The cost of labour being very high in proportion to the cost of material it is foolish to waste labour on cheap materials

In general, a flat coat must not be applied upon a flat coat, but flat enamel is an exception Two coats of oily paint should not be applied one over the other. Two coats of enamel or varnish may follow one on the other with proper preparation in between The new synthetic paints permit the application of two gloss paints, one on the other

The omission of one coat of paint, although unnoticed, may have a vital effect upon durability, or may rob the job of an opaque surface upon which to apply the final coat

Enamel must not be regarded as a coat of paint Gloss enamel has little opacity, so its obscuring value is negligible Piling on excessive quantities of enamel invites defects, one of which is to delay the proper hardening of the enamel

Flat Paint

Flatting is applied to obtain a flat or glossless finish It has a decorative quality peculiarly its own It should be comparatively thin, but will not stand hard wear, and is very easily marked and difficult to clean Flat paint is suitable only for interiors and for parts not likely to be handled much

The material should consist of pigment and turpentine Pigments ground in turpentine are not generally stocked, as a rule, those ground in oil are used for light tints, the quantity of oil being usually sufficient to serve as a binder It must be remembered that some pigments contain much more oil than others For example, white lead has 8 per cent, titanium twice as much From white lead a good flat paint can be made, but from titanium the quantity of oil absorbed in grounding would not permit a flat paint if mixed with turpentine If the oil content is reduced, the result may not be satisfactory, owing to the liability

of titanium to chalk Titanium can, however, be ground in a special medium and excellent flat paints can be made from it

Flat paints can be made from lithopone, although it absorbs a large quantity of oil in grounding, it will still dry flat Some brands of lithopone darken upon exposure to strong light, but good brands are produced in which this tendency is absent In impure air, lead is liable to change colour.

Removing Oil

If pigments contain too much oil, some of the latter can be removed by spreading it upon blotting or other absorbent paper Thus, however, is only practicable with small quantities Oil may be washed out in part by mixing the pigment with an excess of turpentine, allowing it to settle and then pouring off the turpentine which can be used for other purposes

Flatting should be made a day or so before it is required for use The turpentine undergoes partial oxidation and the material works more freely If tinted, it dries slightly lighter than the colour indicated when wet When dark colours are required, it is best to obtain pigments ground in turpentine and add a small quantity of oil if really necessary Flatting which contains either gold size or varnish is liable to flash, and is not so easy to apply *successfully*

The ground upon which flatting should be applied must be oily, at least three parts of oil to one of turpentine It should be applied the day before flatting, if a longer period must elapse it is better slightly to increase the proportion of oil in the ground coat The colour of the ground should closely approximate to that of the flatting when dry

The flatting must be thin, and application to walls must be done with a pound brush It should be applied freely, and though it must be well spread, there should be a minimum of brushwork For small surfaces a flat brush may be used For large wall surfaces, scaffolding should be so arranged that every part is easily accessible Owing to the rapid drying of the flatting, due to the evaporation of turpentine, there is no time to make adjustments of scaffolding, and enough men must be available to ensure that the whole of the surface is covered systematically and, within reason, as quickly as possible It is not difficult to apply flatting and lay it off with the brush, securing an even flat finish If, however, it is preferred to finish by stippling, this should follow application very closely, as delay will bring defects Flatting dries by evaporation of the turpentine, it has a softening effect upon the ground coat, in effect the particles of pigment remain stuck to the surface of the ground coat

Ventilation Points

Apartments where much flatting is being applied should be well ventilated at regular periods during the operation but while work is actually in progress doors and windows should be closed Where surfaces are split up by mouldings, panelling and doors, each part must be cut in carefully For example, if a panel is being flatted the flatting must not be allowed to spread on to the style, if it does, even though wiped off, the flatting applied on the styles later may not dry flat

The surface upon which flat

enamel is to be applied should be flatted first On any other type of ground a satisfactory result is impossible The enamel should be applied freely, remembering that it is a fairly quick drying material, and that each part of the surface must be cut in neatly as for flatting

Flat Wall Paint

Flat wall paints are the outcome of modern developments in paint manufacture, and belong to a different class from flatting Whereas the latter is a thin material, flat wall paint has the consistency of a full-bodied paint It contains more pigment, and the vehicle consists of specially prepared varnish or oils These paints have fairly good obliterating qualities owing to the use of pigments of good obscuring power, such as titanium They may be applied upon any surface finished previously with fairly hard-drying paint, or upon clean, dry plaster which has not been previously treated If walls have been previously papered or distempered paste and distemper must be completely removed or chipping may take place If applied over a surface previously finished with an oil or elastic material, the paint is *liable to crinkle It has a slight* flow, works very easily and may be applied with a flat wall brush

Paint finishes in gloss oil paint are the general practice The material consists of appropriate pigments, such as white lead or titanium suitably tinted If the finish is dark in colour there may be no white basic pigment Gloss is obtained by using a high proportion of oil, generally linseed oil or, for dark colours, boiled linseed oil or varnish The ground should contain practically inverse proportions of oil and turpentine, three parts oil and one part turpentine give a finish suitable for average purposes The paint should have a fair body, should not be applied too freely and should be well spread For wall surfaces the pound brush is the best tool The finish on walls may be stippled if desired

Gloss enamel is a varnish lightly pigmented Varnishes are specially prepared for enamel making, and careful selection of pigment is necessary Zinc oxide and titanium are largely used

Enamel requires careful handling It must not be applied too freely, nor be brushed out too much If over-pigmented as are some cheap enamels, it is more difficult to spread A round or oval brush is best for application Flat brushes are not strong enough, as they do not contain enough bristle Enamel need not be laid off like paint, since it flows out and normally leaves no brush marks It should be applied as freely as possible, but carefully, because of its liability to run or drape

Enamel Ground

The most suitable ground upon which to apply enamel is one *finished with flatting, tinted to* nearly the same colour as the enamel The latter should be applied soon after flatting, if too long a period elapses there may be lack of cohesion between them

In varnish or enamel paints the normal binder for full gloss paints, *i.e.* linseed oil, is displaced by varnish, which is usually less elastic than that used in enamel making Pigments of strong staining power are generally used, thus making possible a minimum of pigment The brilliant gloss obtained by the

use of this type of finish often lacks durability in external work. The material should be applied on a ground finished in flatting. Better results are obtainable by flatting and varnishing: this makes it possible to select a varnish suitable for the surface, indoors or outdoors.

Careful Selection

Full gloss varnish varies considerably in quality and in the purpose for which it is made, so care is necessary in selection. For example, pale varnish is used for light finishes, and so on. Outside and inside qualities are made, as also are hard drying and elastic, each suitable for special purposes. Manufacturers' lists generally give information as to the purpose to which each kind of varnish is suited.

Varnish is best applied to a surface finished with flatting, remembering that the colour will be fuller and darker when varnished. It should be applied upon the flatted surface as soon as the latter is dry and ready. A round or oval hog bristle brush, that has already had some wear, is best for application. Varnish should be applied freely, but must not be allowed to run.

When varnishing and enamelling the surface should be suitably prepared, as a high gloss finish shows up irregularities in it. The prepared surface should be lightly rubbed down and made free from dust. Damp rubbing down has many advantages when varnishing or enamelling. The surface, however, must be dried before application of the material or blooming may result. Whenever varnishing or enamelling is done strict cleanliness must be the rule. Floors must be clean and free from dust. If they have been washed, ample time must be allowed for them to dry, as evaporating moisture may cause blooming, which can also arise from damp weather. The temperature should be fairly normal, several defects being possible as a result of low temperature. In cold weather, enamel and varnish are distinctly less fluid and more difficult to apply.

Upon some surfaces varnish is liable to ciss, that is, it flows away from parts of the surface like water on a greasy surface. This most frequently happens on grained surfaces. The remedy is to damp the surface over with water in which a small quantity of whiting has been dissolved, taking care not to leave too much whiting on the surface. Fuller's earth or powdered dry whiting may also be used, and the surplus dusted off.

Storing Varnish

Enamel and varnish require careful storage in a normal temperature, and all kettles and brushes used in applying them must be scrupulously clean.

Surfaces to be re-varnished require careful washing with a weak solution of soda water or sugar soap, and should be wetted with the solution, working from the bottom upwards. If this procedure were reversed, tears of the solution might run down on to the dry surface, in which case the material would be marked through the action of the solution. In wetting upwards, any tears run on to a surface already wet, and no mark is left. If necessary, a light rub with fine waterproof abrasive paper should be given. This will help to remove dust and any particles of foreign material which have

become attached The surface must be well washed with clean water to remove solution and dirt, and dried with a wash-leather.

As may be necessary, any part may be touched up and the surface re-varnished as for varnishing

French polishing is not durable for external work and is difficult to do successfully upon painted finishes, but varnishes are made which take a high polish. They are hard drying, surfaces upon which they are to be applied need careful preparation Defects and irregularities in preparation are made more conspicuous by a polished finish and increase the difficulty of polishing Polishing varnishes are used upon shop fronts with quite excellent results

Polishing Surfaces

Painted surfaces, especially those grained or marbled and varnished, are often finished by polishing When all painting operations are complete, the surface must be carefully rubbed down, using a fine grade of waterproof abrasive paper Only light rubbing is advisable at this stage A fairly free coat of polishing varnish is next applied and, when dry, lightly rubbed down, and a further coat of varnish added If there is then a sufficient body of varnish, the surface may be rubbed down when perfectly hard, using either very fine waterproof abrasive paper or cuttle-fish and water The scale must be removed from the cuttle-fish and it should be cut into suitable shapes Considerable care and patience are required to avoid rubbing through the varnish, in which case another coat will have to be applied The fine abrasive paper or cuttle-fish establishes a smooth surface, but rather cuts off the face of the varnish, leaving a dull polish

This process is followed by rubbing the surface with powdered putty, or powdered rottenstone and sweet oil or olive oil. Powdered pumice stone, which must be very fine, and may require sifting to remove coarse particles which would cause scratching, may be used in place of water-proof abrasive paper or cuttle-fish The palm of the hand is used as the pad with which to do the rubbing, which is the actual polishing process It takes time, care, and patience to establish a good and uniform polish, but surfaces so treated are very durable When the polish is satisfactory, the surface must receive a final polish with pea flour, again using the palm of the hand This removes all trace of oil

Frequently an inexpensive compromise is necessary Rough timber may be treated with creosote or tar, renewed at suitable intervals Ironwork may be finished after priming by the application of bituminous paints or tar Specially treated tar is available, and sold under proprietary names Priming, however, is essential There is a minimum below which one cannot reduce the number of coats of paint if the wood is placed in exposed positions, for adequate protection is essential to prevent decay Short cuts generally result in very much greater expense later on.

Washing Down

Economy may be more easily practised in repainting surfaces, provided that the previous material is in fair condition Washing is always necessary Paint applied upon a dirty surface cannot secure attachment and may take endless

time to dry Economics may decide the type of finish and the class of material used, varnish or enamel finish being more expensive than a gloss oil paint

Upon suitable surfaces one-coat work may be practicable, but in that case the colour change is limited It is far better to select a colour of approximately the same value than to attempt some striking change which will impose too great a strain upon the limits of both material and craftsman

One-Coat Work

Full advantage must be taken in one-coat work of the fact that some pigments have much greater obliterating power than others A suitable mixture of pigment must be made, as in external work A lead-titanium paint may give a much better result than if either is used alone The selection of suitable coloured pigments for tinting is important

In two-coat work greater changes in colour scheme are possible The first coat may be of lithopone or titanium because of their great density, tinted as nearly as possible to the colour selected for the finishing coat

It is unwise to apply thick paint in an effort to get the desired result, this makes good brushwork difficult The finishing material, which may be comparatively flat or full gloss, must have a degree of fluidity which will allow good brushwork and ensure a solid finish On large flat surfaces use of the stippler will be a great advantage Even enamel may be used for a finish upon two coat work if the surface is in suitable condition Enamel must be applied upon a flat ground Lithopone which absorbs a good proportion of oil in grinding and dries flat and hard, is the best pigment from which to prepare the material Practice and experience will soon teach the young craftsman what may be left out in order to reduce cost

There seems to be no satisfactory and really reliable general specification for the treatment of ironwork, but if the preliminary cleaning and priming have been properly carried out, the remainder of the problem consists of protecting the priming by a series of coats of paint which will prevent the penetration of moisture

The elasticity of the film is important If too hard it may crack or scale Iron expands and contracts freely with changes in temperature The paint film must move in sympathy and with almost equal freedom The addition of paraffin wax to paint for use upon iron-work assists in providing the necessary elasticity

White lead is a suitable pigment in many cases, with the addition of other pigments to produce the desired colour The atmospheric effect upon lead must be remembered Some craftsmen prefer a combination of the basic pigments, and, where necessary, adopt a leadless formula for finishing Generally the lead free darker pigments are not liable to be affected, and some are very reliable if a suitable medium is employed

Full Gloss

Where lead is used, a straight linseed oil medium may be employed plus the necessary amount of turpentine rotating in proportion, and finishing with a full gloss material Where lead is absent a treated oil may be more suitable, and stand

oil or linseed oil will prove reliable, while tung oil has very good water-resisting properties

A well-prepared varnish paint or a varnished finish will undoubtedly prove best of all, but the varnish must be elastic

Bitumen paints are very satisfactory, but there are limitations to the use of black finishes Further, when repainting becomes necessary, the finish is rather tied to black because normally oil paints do not dry satisfactorily on bitumen paints

It is a great advantage for craftsmen to be able themselves to prepare material suitable for all kinds of jobs In the past twenty years great changes in trade practice have come about. Before then, ready prepared materials were practically restricted to varnish and enamel Manufacturers to-day prepare paints for every purpose, and present them in the way they consider best suited to each They have overcome great difficulties regarding materials The settling out of heavy pigments in certain kinds of paints, for example, has largely been overcome by the introduction of what may be described as supporting pigments, pigments which, because they are flocculent, prevent heavy particles falling out of suspension.

Much time has been saved by the introduction of prepared undercoatings and paints of great density and obliterating power Paints have been produced which dry very rapidly Very many types are produced for finishing coats

Certain defects may be more prevalent, notably scaling and flaking This is due to surfaces receiving too many coats of hard dry, inelastic undercoating paints without the intervening oil coats, which would tend to correct the hardness These intervening coats would be applied if the craftsman prepared his own material, and even the hard drying paints prepared by him are not so hard and brittle as are some of the manufactured undercoatings All this arises not from a fault in manufacture, but rather from misunderstanding and the improper use of the article manufactured

Bulk Production

Generally, specialised materials produced by manufacturers are all that is claimed for them They set a very high standard for bulk production If there is anything wrong with a batch of material consisting, perhaps, of several tons, complaints will be numerous, because such a batch will be distributed to a large number of purchasers Manufacturers do not receive many complaints

Bulk-produced materials have advantages and disadvantages and some limitations It is the responsibility of those who draft specifications to do so intelligently If they specify manufactured material they should study the published literature and make themselves familiar with the claims made, and the instructions for its use

One disadvantage lies in the accumulation of quantities left over, and the collection of remnants which may not intermix

The production of bulk materials has come to stay, but there will always be jobs in which the craftsman can exercise his own skill in preparing paints suitable for each stage and for each purpose Success will always depend chiefly upon good craftsmanship coupled with a thorough knowledge of materials.

CHAPTER IV

DISTEMPER AND DISTEMPERING

COMPOSITION OF DISTEMPER LIMEWASHING PREPARATION OF SIZE WHITE AND COLOURED PIGMENTS MIXING WHITE DISTEMPER MATCHING SAMPLES COLOURED DISTEMPERS PREPARATION OF SURFACES HARD PLASTER FINISHES *PAINTED AND BUILT-UP SURFACES MATCH BOARDING SCENE PAINTING* SURFACES FOR WASHABLE DISTEMPER FIRE-PROOFING TIMBER SURFACES APPLICATION OF WASHABLE DISTEMPERS DECORATIVE USE OF DISTEMPER

DISTEMPER is a composite material used by painters in which the main carrier and diluent is water, and the fixing agent a colloid or jelly-like substance capable of considerable dilution without losing its natural characteristics In ordinary use this is glue, the *sticky or gummy* matter extracted from animal hoofs and bones by boiling In its more concentrated form it is a hard, brittle substance which, on heating, may be used as a fixative for timber *By reduction with water only, it* becomes a suitable adhesive for fixing distemper to the surface upon which it is applied and binding together the particles of the pigments of which it is composed

How Distemper Dries

In common with all gummy substances, it dries, without any chemical change, by the evaporation of the water content, and is capable of re absorbing moisture It is in this characteristic that distemper differs so much from an oil medium paint in which there is a definite chemical change in the drying or solidification of the film

Obviously, *ordinary distemper* is unsuitable as a protective coating upon surfaces likely to make contact with water Its main recommendations are that the materials from which it is made are cheap and that its application is a simple process It gives a clean, fairly hygienic finish in dry situations and is capable of being exploited in a *decorative manner.*

Its inability to resist moisture led to the use of quicklime dissolved in water for exteriors and surfaces which had to stand hard wear Such treatment is called "limewashing" *and was in general use for many* centuries before the advent of oil painting

In this case freshly burned limestone is slaked in water, forming a more or less colourless liquid When it is extended as a film upon a surface a chemical reaction occurs, the water evaporates and the lime combines with carbon from the atmosphere to produce an opaque film of carbonate of lime, *firmly* attached to any clean surface upon which it is formed

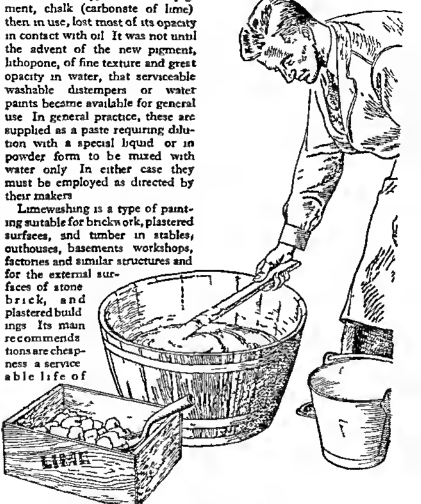
During an extended period many experiments were made with ordinary glue-bound distemper to render it waterproof or, at least, *washable* The addition of bichromate of potash phosphate of

soda and silicate of soda were tried and found to be fairly successful The mixing of limewash with milk led also to the use of other emulsions of oil and water as the medium or fixing agent

Unfortunately, the main pigment, chalk (carbonate of lime) then in use, lost most of its opacity in contact with oil It was not until the advent of the new pigment, lithopone, of fine texture and great opacity in water, that serviceable washable distempers or water paints became available for general use In general practice, these are supplied as a paste requiring dilution with a special liquid or in powder form to be mixed with water only In either case they must be employed as directed by their makers

Limewashing is a type of painting suitable for brickwork, plastered surfaces, and timber in stables, outhouses, basements workshops, factories and similar structures and for the external surfaces of stone brick, and plastered buildings Its main recommendations are cheapness a service able life of twelve months and a clean uniform appearance It also conforms with the statutory regulations for the hygienic cleansing of workshops and factories

The materials required are freshly



MIXING THE INGREDIENTS OF LIMEWASH

Fig 1 Lime is broken into comparatively small pieces and dissolved in water in a reasonably sized tub a long flat strip of wood being used for stirring the mixture.

Fig 2. Adding a little lime blue in the mixing to improve the colour.

burned lime and clean water A large tub is required for slaking the lime This tub is not more than half filled with water and the lime is added lump by lump (Fig 1) Contact with the water causes a considerable ebullition and an increase in temperature A long flat strip of wood is required for stirring the mixture during the slaking until the boiling has ceased

Improving Colour

The material now has the appearance of thin milky water and is ready for use, but the resulting finish may not be snow-white owing to the presence within the burned limestone of the products of the combustion of the coal by which it was fired Therefore, it is a general practice to mix lime blue (cheap ultramarine blue) with water in a separate can or bucket, making sure that it is thoroughly mixed by stirring it with a flat stick, and then adding it to the main bulk of the material (Fig 2) Do not overdo this or it will result in a blue wash

The colour of limewash may be varied by the addition of yellow ochre to give a cream colour, Venetian red to give a pink; Dutch pink to give yellow, Dutch pink and lime blue to give a green, rather dull in hue, or lime green to give a brighter green

Surface Preparations

Prepare the surface by brushing it down thoroughly with a bass broom and, with a broad knife, remove all roughness caused by caked mortar and dirt (Fig 3) The surface should be as dry as possible with adequate ventilation If there are patches of grease, as much as possible should be removed with the broad knife and the surface then washed with white spirit The equipment should include two buckets, one for limewash, one for clean water, a Turk's head brush with a long broom handle, a flat brush, a broom and coarse sacking or heavy dust sheets to cover machines, appliances, and furniture which cannot be moved The minimum of scaffolding is generally used, two pairs of trestles and a plank and one pair of steps usually being adequate

Remove all the fittings that can be shifted conveniently and thoroughly sheet over the remainder (Fig 4) If you have no floor cloths, wet the floor with

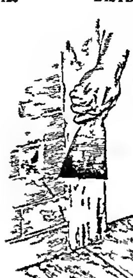
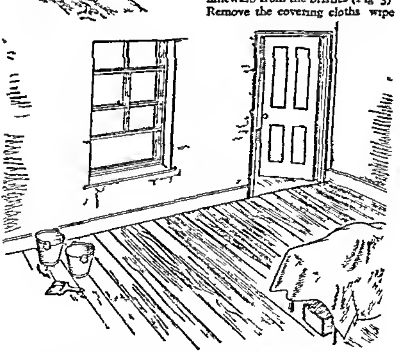


Fig 3. Removing all caked mortar and dirt from the surface before applying limewash.

clean water so that spots may be easily removed.

Apply the limewash with the appropriate brush in a good full coat carrying the coated portion along evenly. In appearance it will seem only wetted with little of the finishing colour in evidence. As soon as the surface is coated give it as much ventilation as possible: fresh air is necessary for the chemical reaction which takes place during the evaporation of the moisture content. To obtain the best results this operation should not be protracted.

On the termination of the job the brushes must be thoroughly washed in water to remove all traces of limewash from the bristles (Fig 5). Remove the covering cloths, wipe



ROOM CLEARANCE BEFORE STARTING WORK

Fig. 4. Everything possible should be taken out and the remainder covered with sheets.

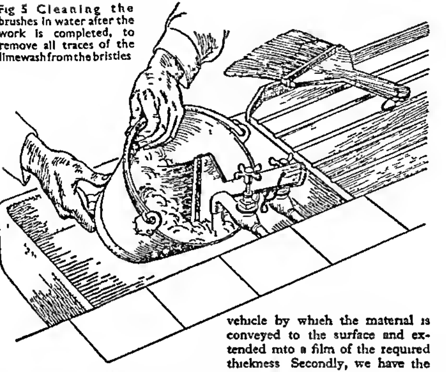


Fig 5 Cleaning the brushes in water after the work is completed, to remove all traces of the limewash from the bristles

off any spots with a damp cloth, and clean up the floor If this is not done, marks will result which will later be difficult to remove If necessary, a second coating may follow, but the first must be thoroughly dry before this can be satisfactorily applied

The serviceable character of this method of painting is demonstrated in many old buildings and cottages, where films of considerable thickness have been formed upon the walls by the periodic treatment of the surfaces with this type of material

In all true distempers the material is composed of two parts First is the medium or liquid This is the means of attachment of the distemper to the surface upon which it is applied and of holding together the separate particles forming the film, it is also the vehicle by which the material is conveyed to the surface and extended into a film of the required thickness Secondly, we have the pigment or solid to give substance to the material and so to obscure the surface upon which it is placed, and to give colour value It may, of course, also give some measure of protection to the medium within the body of the film

Oldest Adhesive

It is reasonable to suppose that the jelly-like material obtained by the cooking of animal flesh is the oldest form of adhesive used for the fixation of pigments The accidental discovery that the coloured earth with which man smeared his body and utensils 'stayed put' better, and was easier of application when rubbed up in this juice, very soon led to its general adoption Its suitability for this purpose is demonstrated by its persistence in that capacity down to the present time

In modern practice, size is now

sold as cake glue, concentrated size, and size in stiff jelly form. All these require reduction with water until a solution is obtained which will set into a trembling jelly form when allowed to stand in a temperature of 60 deg F

Animal glue is insoluble in cold water but freely soluble in hot, so to bring it to this jelly consistency it must first be broken up with a hammer and allowed to stand in cold water for twelve hours (Fig 6) During this time there will be a considerable increase in bulk. Gentle heat can then be applied until it is all dissolved Four ounces of glue to one gallon of water should produce a size of working consistency

Concentrated size is a granular form of glue in a less concentrated form In normal practice it is purchased in packets of various weights The required quantity is placed in a bucket, well covered with cold water and well stirred It is allowed to stand for several hours to soak thoroughly and then the necessary amount of boiling water is added One pound of concentrated size should make two gallons of size of working consistency These powders, however, differ so considerably in strength that instructions are generally printed upon the containers, and all such instructions should be followed with care.

Jelly size is a specially prepared jelly of the same nature as glue Its special advantages are, first, that it can be easily brought to the required consistency by the addition of boiling water, and, secondly, that it may already contain a disinfectant to prevent putrefaction

Testing Size

The quality of a size is tested for

(1) Adhesiveness, its power of gripping a surface upon which it dries

(2) Cohesion, that is, consistency in its jelly form It should not crumble but break with shell-like fractures when the thumbnail is passed lightly over its surface (Fig 7)

(3) Rate of setting After dilution it should assume the jelly form in a reasonable time

(4) Carrying power, that is, the amount of water required to reduce it to a working consistency The greater this is the more size of the right substance will be produced

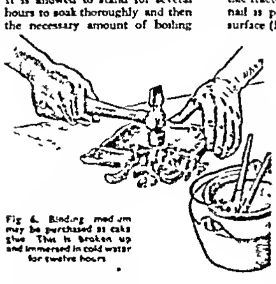


Fig 6. Binding medium may be purchased as cake glue. This is broken up and immersed in cold water for twelve hours

The addition of a disinfectant has been mentioned This

Fig 7 Size is tested for its cohesion qualities after preparation by passing the thumbnail lightly over the surface

should never be omitted, or putrefaction will occur and the nature of the size be destroyed A little carbolic acid or chloride of lime is all that is necessary

Various pigments are needed to obtain *consistency* and colour but the chief white used is chalk (carbonate of lime), which is quarried, ground, sorted into grades by levigation and sold as Paris white, whiting, etc The best quality is smooth to the toueb and free from grit It will readily take up water, becoming a smooth paste with little obscuring power, when it loses its absorbed moisture by evaporation its obliterating power is great Since it is an alkaline earth, there is a somewhat limited selection of pigments which may safely be used with it without any likelihood of change in colour value It can be taken for granted that all the earth colours may be used, and any others which are sold as lime resisting Pigments which are affected by acid fumes should be avoided, as the medium in this type of painting gives little or no protection

Coloured pigments may be used to produce various tints as follows

Yellow Dutch pink, lime yellow, ochre, raw sienna

Red burnt sienna, Venetian red, Indian red, purple oxide

Blue lime blue (reduced ultramarine)

Green mixtures of the yellows and lime blue, lime green

Purple lime blue and purple oxide

Brown raw umber for greenish hues, burnt umber for reddish hues

Note all these pigments may be used alone as a distemper

White Distemper

To make white distemper you will require two buckets, a flat mixing stick, a paint can, a strainer covered with cheese cloth, some Paris white, lime blue, jellied size, and water

Proceed by placing water in one of the buckets and adding the Paris white, a little at a time, until it stands in a cone above the level of the water Leave it to soak thoroughly, then pour off all the water not absorbed and, either with the stick or with the band, beat up the white into a smooth paste (Fig 8) Place a little water in the paint can and to this add a little lime blue, stir and allow to soak Add some of this blue to the

paste white and stir in Now add prepared jellied size to increase its bulk by about one quarter, and slowly stir together in order to retain the jellied character of the binding medium

The distemper should now have the consistency of thick cream Test by extending a little on a sheet of paper and allowing it to dry This will indicate if sufficient blue has been added to give the re

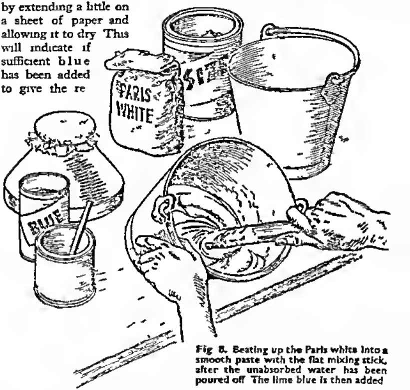


Fig 8. Beating up the Paris white into a smooth paste with the flat mixing stick, after the unabsorbed water has been poured off The lime blue is then added

quired whiteness, and abrasive action will show if sufficient size has been incorporated to fasten it to the paper and hold the whiting together A fault in the colour can be corrected by the addition of a little more blue Adhesiveness may be increased by adding more size

When the necessary adjustments have been made, strain if possible, through the cheese cloth into the second bucket by gravitation only (Fig 9), otherwise by gentle stirring with a worn sash tool The material is then ready for use, although many painters prefer it to stand overnight before application

The necessary requisites for a tinted distemper are two buckets, several paint cans, strainer covered with cheese cloth, palette knife and board stirring stick Paris white, the coloured pigments to match a given sample, prepared jellied size, and water

If the sample is executed in distemper first wet a portion of it to discover the tone of the colour in liquid form. Make a paste with a little Paris white and water by

tempering up with the palette knife upon the board (Fig 10), and make other pastes in a similar manner, using the coloured pigments which inspection suggests as necessary to match the wetted sample Add these to the white paste and thoroughly mix with the palette knife, carefully noting the proportions by bulk of each of the colours required to make the match When this appears satisfactory, add a little jellied size, brush out with a fitch upon paper and dry Compare this with the dry sample which had to be matched

If the tone is wrong, it can be adjusted by using a greater or less quantity of Paris white If the hue is at fault the quantity of the pigment responsible will need adjustment Fresh comparisons should be made with dry samples until a reasonable idea is obtained of the quantities required The making of the main bulk may then be proceeded with without delay

Mixing Ingredients

Soak the Paris white in water, pour off any excess of water and mix into a smooth paste with a stick Soak measured quantities of each coloured pigment required in separate containers mixing each into a smooth paste Allow time for thorough wetting and then stir each into the Paris white Add the jellied size to increase the bulk of the mixture by one quarter, and slowly stir together Again test a dried sample for match, and make any necessary adjustments Finally, strain the whole and allow it to stand for some hours before using

In the making of tinted distempers some of the pigments may be heavier than others when compared bulk for bulk These are

Fig 9. When the mixture has been strained into a second bucket it is ready for use.

liable to gravitate to the bottom of the mixture Therefore, it is usual to keep the latter constantly stirred during application A better practice is to temper the heavy pigments with jellied size, instead of wetting with water, before adding to the bulk of the material After straining these pigments remain suspended and evenly dispersed throughout its mass, and stirring is unnecessary

Other pigments are flocculent, and are with difficulty wetted with water, but are easily tempered in jellied size with a palette knife upon a board in place of the usual mixing with water They are best added in this form

It cannot be too strongly stressed that the painter must never add coloured pigment in dry powder form to the wet mass of the Paris white Pigments added in this way form into small pellets of colour with wetted exteriors and dry centres, like nuts with white shells and coloured kernels Hence their colour value is lost until the outer

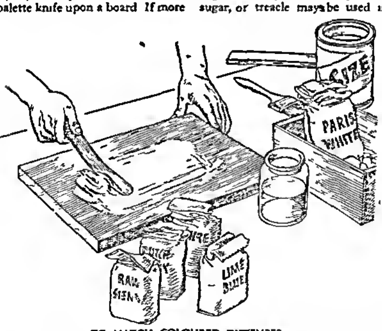
shell is broken by the action of brushing on the material, and they appear as coloured streaks in the finished work Straining the distemper will not cure this defect

Coloured distempers may be made from most of the coloured pigments without adding any white pigment The only conditions imposed are that they must be finely ground, have no action one upon the other in contact with water, and not be subject to discoloration by acid laden vapours Statutory regulations forbid the use of white lead and emerald green as pigments for distemper painting

In mixing such distempers the dry pigments are first wetted with water, or tempered into size with a palette knife upon a board If more than one are used to obtain the required hue, each is dealt with separately They are then mixed together and tested for colour by drying after extension on a sheet of paper If the colour is correct, jellied size is added The whole is then strained to ensure a uniform mixture of the ingredients throughout

Preventing Decay

Additions may be made to glue-bound distempers for special purposes as follows Carbolic acid, chloride of lime, or other disinfectant, added in small quantities to prevent premature decay of the fixing agent by rendering it unsuitable as food for animal or vegetable organisms Glycerine, sugar, or treacle maybe used in



TO MATCH COLOURED DISTEMPER

Fig 10 First of all the sample which it is desired to match should be moistened so that its tone in liquid form is revealed Then a paste of Par s wh te and size is mixed and pigments added until the tone of the sample has been obtained

TREATING PLASTERED WALLS AND CEILING

Fig 11 Two or more pa rs of step-ladders are required a sponge and worn flat brushes or d stemper brushes with clean warm water completing the equipment.

small quantities to retard drying should the atmosphere be exces sively dry They also impart flexi b lity to the dried film in order that it may be applied upon paper or canvas and rolled w thout fracture of the film Alcohol (spirits of wine) assists in the evaporation of water if the atmosphere is excessively humid It also tends to harden the size Soap prevents excessive ab sorption by a porous surface. It is generally incorporated in under coatings

Distempers are best applied upon a slightly absorbent ground This ensures some penetration of the surface by the applied material and establishes a key between the two Plastered surfaces are specially suitable for this treatment as they generally present large areas of fairly even texture However sec tions of the same surface may vary considerably in porosity This no doubt occurs through carelessness in gaug ng or mixing the plaster

It is to correct this unevenness of absorption that preparation is necessary upon d stempering newly plastered walls Satisfactory work cannot be done upon damp

or wet surfaces All surfaces must be thoroughly cleaned before treatment Lime plastered walls and ceilings should be given as long as possible to dry out by the natural evaporation of the moisture content, and to solidify by the chemical reactions which take place within the fabric They should then be glasspapered, dusted down with a brush, and coated with weak jellied size to create even absorption over the whole of the surface

Priming Coat

In dealing with new plaster cornices, dust down thoroughly and paint with a primer made from genuine paste white lead ground in linseed oil, driers, raw linseed oil, and white spirit or turpentine The primer must be thin, and dry hard Besides overcoming the uneven absorption, the painting will protect the cornice when washing off becomes necessary at a future date

Plastered walls and ceilings which have been previously distempered must have all the old material removed If the premises are furnished, all movables are best taken out of the room and the remainder carefully covered with dust sheets

A minimum scaffold consists of two pairs of step-ladders and a plank (Fig 11) Work is carried on more conveniently with four pairs of step-ladders, two runner planks, and a cross plank Two buckets, three parts full of clean warm water, worn flat brushes or distemper brushes, and a large sponge are required

Lay in with water as much of the ceiling surface as can be conveniently reached In a few minutes follow with other coatings until the surface is thoroughly saturated Scrub with the side of the bristles to work up the softened distemper to a paste and take off, still with the side of the brush Rinse the brush in one of the buckets of water and, when it is fairly clean lay in with clean water and take off with the clean sponge It is a saving of time to make good at this stage any cracks in the plaster Rake out these with a chisel knife and shave-hook, slightly undercutting the edges (Fig 12), moisten with clean water and fill with a stiff paste made from plaster of Paris and Paris white in equal quantities, and water Press this well into the cavity with the chisel or broad knife and remove any surplus from the surface

This part of the work requires far more care than it usually receives It must be remembered that for the best

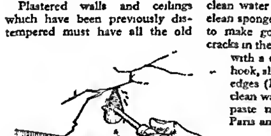


Fig 12. Repairing cracks in the plaster by first raking out with a shave-hook, slightly undercutting the edges. See bottom (left) for section showing the undercut

Fig 13 Laying in skirtings with clean water before removing old distemper

results distemper must be applied upon an even, plane surface Any knobs, hollows or roughness upon it will be exaggerated by the incidence of light thrown across its surface from one side As a room is generally lighted from a window, placed in one side, the surfaces of the ceiling and two of the walls are approximately at right angles to it, and parallel to the light rays This provides a situation which will test to a high degree the flatness of the surfaces in question

To remove the distemper from walls, commence wetting from the floor level, laying in the skirting first with clean water (Fig 13) As soon as a convenient stretch is coated from floor to ceiling, recoat it with water until thoroughly saturated, then proceed with scrubbing, removal sponging, and repairing as already described Particular care should be taken with the raking out and repair of the plaster surface where it contacts timber, as in skirting and architraves By sponging and leathering the paint work, it should always be left thoroughly clean

Applying Size

When dry, the whole surface is glasspapered, dusted with a dry brush, and given a coat of weak jellied size This is applied evenly and slowly with a large flat brush, so that the portions which are most absorbent may have time to become saturated The difference in absorption is thus corrected by the greater quantity of size in these portions

Badly stained ceilings In some old houses the plaster surface is badly stained In many cases this has been caused by the application of undercoatings in which such substances as boiled linseed oil and soft soap have been included In course of time the plaster has become so discoloured that the only satisfactory cure is to paint the whole surface with thin, hard drying white paint, made from genuine white lead ground in linseed oil driers, refined raw linseed oil, and white spirit or genuine turpentine If this is kept flat, distemper can be satisfactorily applied, providing the atmosphere of the room is generally dry If excessive humidity is likely, the same treatment should be given as for badly cracked surfaces

Various methods are employed when dealing with badly cracked

plaster When the old distemper has been removed the plaster surface may reveal innumerable small cracks Satisfactory repair by raking out and filling is plainly impossible In such a case it is general practice to rake out and fill only the worst cracks The dry surface is then coated with weak jellied size, again allowed to dry, and lined with paper, butt jointed Lining paper is a satisfactory ground for receiving distemper without further preparation

Parian and other hard plaster finishes are unsuitable for the direct application of glue bound distemper They are hard, non porous and have a surface temperature below that of the contacting atmosphere in consequence, moisture

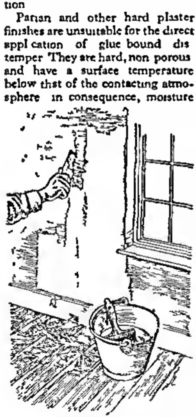


Fig 14 Distemper and paper are removed by thoroughly soaking the entire surface with water applied with a flat brush and then using a broad knife

readily condenses upon them with changes of temperature if the air is humid

The water so condensed is taken up by the superimposed absorbent glue bound distemper with the following results There is considerable darkening of the tone and hue This may be only temporary if a dry period follows but if prolonged, dust and soot may deposit upon the surface and become firmly attached causing permanent disfigurement Moreover, if the condensation persists or is frequent the adhesive quality of the binding medium is impaired, if not completely destroyed In such a case the pigment becomes loosely attached to the surface and is carried down the surface in tear like streaks The slightest abrasive action will remove it completely

Preventing Condensation

To overcome these disabilities it is usual to line such surfaces with paper this inserts a film which is non conductive to heat between the cold surface of the plaster and the warmer atmosphere Condensation is therefore to a large extent prevented and glue bound distemper applied upon the paper surface without further preparation will render satisfactory service

Rub the surface with glasspaper remove all foreign matter from it and dust down Make good all defective portions by raking out with the chisel knife and shave hook wetting and filling with a paste made from one part hard plaster one part whiting and water As soon as this has set paint the new patches with a paint made from genuine white lead ground in linseed oil driers refined raw linseed oil and white spirit or genuine

turpentine Size the whole with weak jellied size and cover with white lining paper, butt jointed, using flour paste as an adhesive Allow this to dry and then apply the distemper

To distemper surfaces previously lined and distempered, the whole of the distemper and paper is removed in one process by thoroughly soaking with water applied with a flat brush and removing with a broad knife (Fig 14) The entire surface is then thoroughly washed with hot water to remove all the old paste All defective portions are made good by raking out, wetting, and filling with hard plaster and whiting in equal proportions, made into a stiff paste with water When set, these portions are primed with sharp white lead paint The whole is then sized with weak jellied size and covered with white lining paper, butt jointed, the adhesive being flour paste This is allowed to dry and then distempered

Unsuitable Surfaces

Plastered surfaces which have previously been finished in oil paint are unsuitable for the application of glue bound distemper, as the absorption required is completely lacking in a surface so treated It also has a surface temperature normally lower than that of the contacting atmosphere Both these conditions are found in hard plaster surfaces and have to be corrected before glue bound distemper can be satisfactorily applied to them For painted surfaces it is generally more economical to repaint than to take the necessary precautions indicated for hard plasters

It may so happen, however, that where extensive re plastering has been executed in old premises certain painted walls have not been replaced and the finish specified for these is the same as the new plasterwork, that is 'Prepare and distemper in glue-bound distemper" In such a case these sections require special preparation

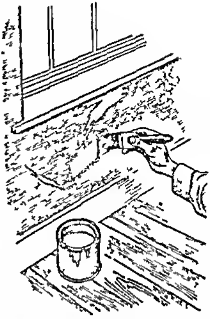


Fig 15 After cracks and cavities have been satisfactorily filled they should be primed with sharp white lead paint

The surface of the oil paint is partly broken down by coating with a weak solution of soda and water and breaking the surface by the abrasive action of pumice stone or waterproof glasspaper It is then thoroughly washed with clean water, all cracks and damaged patches are raked out and repaired These are wetted and the cavities filled with equal parts of hard plaster and whiting mixed to a stiff paste with water When this has set, these fillings are primed with sharp white lead paint (Fig 15) The paint is left to dry after which

the whole surface is sized and lined with paper as indicated for hard plaster surfaces

Surfaces built up from wall boards, cardboard, and plaster finishes generally take distemper well The only preparation needed is a coat of jellied size However, if the ceiling or wall surface has been built up without covering the joinings with timber strips, a more lengthy and expensive process is required to ensure a satisfactory finish

In such a case, along each side of the joint size a strip 4 in wide and allow it to dry Cut strips of butter muslin or thin calico 6 in wide, coat in the surface of the sized strips with good stiff flour paste, lay the canvas strips upon this and press or roll them down into contact with a rubber roller (Fig 16) When dry, size the whole of the wall surface Again allow it to dry, and line the whole with paper, butt jointed and at right angles to the run of the lengths of the boards, the adhesive being good stiff flour paste

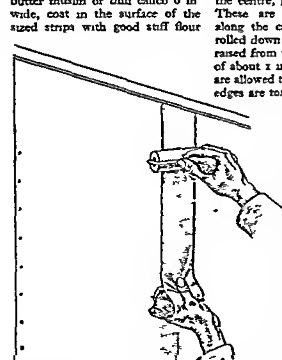


Fig 16. How a joint in a wall that has been built up from wall boards, cardboard and plaster finishes is first covered with butter muslin or thin calico strips.

Feathered Edge

In cheap work the canvas strips only are covered with lining paper In such a case, after sizing the whole surface, the lengths of lining paper, after pasting, are cut down the centre, giving strips of 11 in These are placed into position along the canvas strips and well rolled down Their long edges are raised from the ground to a depth of about 1 in and in this position are allowed to dry When dry these edges are torn off so as to leave a *feather edge*, that is, an inclined plane from the wall surface to the surface of the paper, this does not show through subsequently applied distemper to the same extent as a clean-cut edge (Fig 17 shows before and after tearing off)

In some premises one wall of a room is composed of match boarding while the remainder are finished in plaster but the whole must present the same appearance when finished

For the boarded section the specification

would therefore be: "Canvas, line, and distemper," and the procedure is as follows:

Stretch butter muslin or thin calico over the entire surface in lengths equal to the width of the material, and tacked to the timber surface along the edges (Fig. 18). The lengths must run the long way of the boarding, not across the joints, and each length must link up with the next by being nailed to the same board.

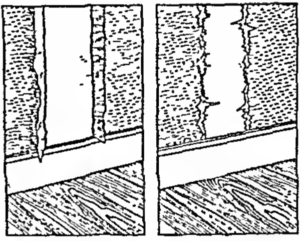


Fig. 17. Edges of lining paper raised and allowed to dry (left), then torn to leave feathered edge (right).

Coat the heads of all the tacks with knotting (Fig. 19). Size the whole with jellied size. The latter must not be thin, as it is required to remain upon the surface only, and not to penetrate to the boarding. This leaves the boards free to contract and expand behind the canvas without breaking the surface. Line with stout lining paper, butt-jointed and run at right angles to the lengths of the applied canvas (Fig. 20), when dry, distemper.

Fig. 18. Stretching butter muslin or thin calico over the boarded section of a wall

Glue-bound distemper is the type used on canvas for scene painting. To economise in space, cut down weight and aim at flexibility, the groundwork is good quality flax cloth, 6 ft wide (Fig. 21A). This is joined together to form large "cloths," "cutcloths," and "borders," or stretched upon frames to form "flats" and "grounds." During execution, and for convenience in handling, these are generally

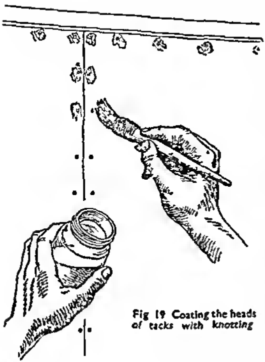
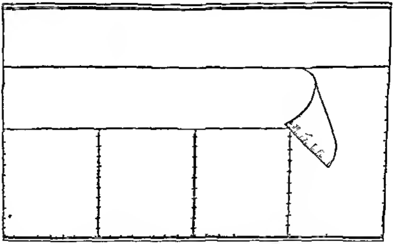


Fig 19 Coating the heads of tacks with knotting

fixed to large adjustable frames (Fig 21B) but where the latter are not available the painting can be executed with the canvas stretched upon a large floor The instability of the ground and the need for rolling up the large cloths for transit call for special tenacity and flexibility in the applied film This is assured by special attention to the composition of the preparatory coat or priming

This priming is made by soaking Paris white or whiting in water, and beating to a stiff paste, as indicated for the making of a white distemper A size is prepared as previously described but of double



TREATMENT OF MATCH BOARDING

Fig 20. Strong lining paper is butt-jointed and run at right-angles to the lengths of the butter muslin or thin calico, and then when dry finally distempered

the strength This, when cold should be too gelatinous to spread with a brush While the size is still hot, a quarter of a pound of treacle is added to each gallon of size progress of the work When dry, it presents a white even ground upon which very thin colour yields excellent results

The pigments used are generally

DISTEMPER FOR SCENE PAINTING

Fig 21A Priming is prepared with size double usual strength and rendered flexible with treacle If convenient the canvas should be stretched on a wooden frame

While the size is still warm and liquid it is mixed with an equal quantity of white paste The mixture is applied with large brushes evenly and regularly making sure that the whole surface is covered The material should be kept warm and well stirred up during the obtained as pastes ground in water, if obtained dry they must be converted to a paste by tempering or grinding in water The medium used for their extension and fixing is flexible size, diluted to half its normal strength with cold water

The ground having received its

appropriate preparation, and the distemper made, as usual, the day before, consideration can now be given to the method of applying the final coating The material is extended upon the surface by brushing

The brushes specially made for use with distemper are as follows

Flat brushes—large, flat brushes made with long hog hair bristles attached to the handle in various ways

Knot brushes, which have the bristles in a more compact mass and may have one, two, or three knots or bundles assembled upon one handle

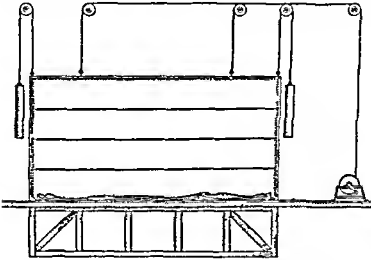
Sash tools—round brushes with fairly long hair and of many sizes, and

Fitches, smaller varieties of the latter, also of many sizes and lengths of bristle

The largest brush which can be conveniently handled within the area to be covered is selected, a brush is at its best for use when it has been "broken in," that is used for a time for such jobs as washing off and sizing

Brushes with short, stiff bristles, or with bristle which has lost its spring are unsatisfactory

Arrange the available scaffold in such a manner that no time will be lost by major adjustments during the time the distemper is being applied to the surface Cover with dust sheets all furniture and other objects liable to be damaged by the fine spray thrown about during the progress of the work. Close doors and windows to prevent too-rapid evaporation of the water contained in the distemper which is to be applied Make sure you have sufficient material to complete the job in hand, and that it is contained in a bucket large enough for convenient



ADJUSTABLE FRAME FOR CANVAS

Fig 21B. More elaborate frame to assist in the distempering of canvas.

dipping to charge the brush With a flat lath of wood stir up the material thoroughly, taking care not to destroy its thick cream like consistency

One operative can conveniently deal with a strip of surface from 6 to 8 ft wide If the space to be distempered is wider than this an extra man is required for each additional 6 or 8 ft Charge the brush with distemper and commence operations upon that part of the surface nearest to the source of the light (that is, the window) Cut a clean edge and lay on a good full coating evenly distributed by the use of long swinging strokes in all directions (Fig 22) Do not work in straight lines nor cross and recross as in oil painting Carry along the whole width of the area without allowing the progressing edge of the material to become set Make sure you do not miss any part and do not turn back to touch up If this is done, a change of texture will be noticed when the surface has dried A similar change will be visible if the edge of the patch becomes set before the next patch is worked in

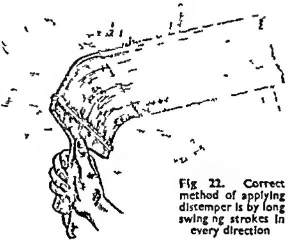


Fig 22. Correct method of applying distemper is by long swinging strokes in every direction

Ventilation Required

As soon as the whole area is covered arrange as much ventilation as possible by opening windows and doors to promote rapid evaporation of the water content With a sponge and clean warm water, remove any spots of material which may have dropped where they are not wanted Wash the brushes thoroughly in hot water shake them out and hang them up with the bristles downwards (Fig 23)

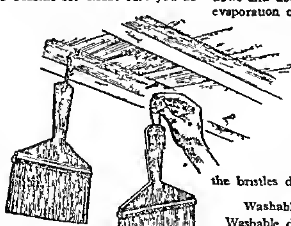


Fig 23 When not in use brushes should be hung with the bristles downwards.

Washable Distempers

Washable distempers and water paints are an improved type of the old glue bound distemper and incorporate improvements in both

the medium and the pigment contents The old fixing agent, animal glue, may still be used as one of the constituents, but its function is to assist in forming an emulsion of linseed, or other drying oil, and water In this, each globule of oil is enveloped by a film of glue and suspended in water In the drying or solidification of this film, both oxidation of the oil and evaporation of the water plays its part

With media of this type the distemper is supplied to the operative painter in the form of a stiff paste which requires dilution with a special thinner (petrifying liquid), also supplied ready for use Paris white is replaced as the main white pigment by lithopone, a compound of barium sulphate and zinc sulphide Lithopone is a very fine white powder which, when wetted, remains white and does not lose its opacity or obscuring power When mixed and ground with other pigments the resultant paste is about the same colour and tone as it is when extended as a dry film In this respect it is a notable improvement upon the old glue bound distemper, in which a considerable change of both tone and hue had to be considered Also, it has no action upon the coloured pigments, and may therefore be tinted with any of them

Another type utilises the colloid albumen The best known example of this is the white of an egg, which when reduced with water, is still utilised for small work by painters Casein, the light friable substance contained in skimmed milk and obtained by precipitation with an acid, is also an albuminoid When casein, quick lime, and borax, mixed together dry, come into contact with water the casein is dissolved and becomes the fixing agent after the water has evaporated

Distemper of this type is supplied as a dry powder, if it is required coloured, the pigments are added as dry powder during manufacture Such distempers are converted into liquids for application merely by adding clean water The instructions generally printed upon the container must be carried out in their entirety

To mix white washable distemper (*type 1, paste form*) requires two buckets, a flat mixing stick, a large strainer covered with cheese cloth, a broad knife, drums of the proprietary brand of white in thick paste form, and petrifying liquid, and water

Mixing the Materials

Wet the inside of one of the buckets with water, open the container of white paste, and remove any hard crust which may have formed Then with the broad knife take out and transfer to the bucket the required quantity of white (Fig 24) This can be calculated as follows 14 lb of the paste white plus 5 lb (approximately 1 qt) of petrifying liquid will be required for every ninety yards to be covered with one coat To the paste white add a little of the petrifying liquid and mix well with the stick In cold weather the mixture will be made more easily by warming both the paste colour and the liquid, but do not warm by direct contact with heat, as by placing the container upon an open fire or gas ring When well broken-up add more of the liquid until the required proportions are reached stirring all the time Strain through cheese-cloth into the second bucket to

Fig 24 To mix a white washable d stemper f rst wet the inside of one of the buckets with water and then transfer the required quan tity of wh te from the container and fixative F nally pass through the strainer before use

ensure thorough mixture and to remove any fore gn matter

For type 2 (powder) two buckets mixing stick strainer covered with cheese cloth material in powder form and water are required

The normal method of prepara t on is to empty the dry powder from the container into one of the buckets Add water slowly stirring all the t me until the quant ty ind cated upon the package has been added and a smooth cream l ke consistency developed Allow the d stemper to stand for several hours to ensure the adequate wett ng of all the particles of powder colour

Should the instructions of the makers of the distemper recom mend the use of hot water in place of cold or otherwise differ in the method by which the water is added the r directions must be followed to obtain the best results

Matching Colours

To match coloured washable dis temper to a dry sample (type 1 paste form) the requirements are two buckets flat stirring stick hand board palette knife broad knife strainer covered with cheese

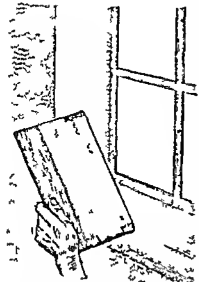


Fig 25 When matching coloured distemper brush out some of the newly mixed colour on cardboard and allow it to dry for at least twenty four hours

cloth drums of paste white small tins of the necessary colour p g ments in paste form ground in the same med um as the paste white and petrifying liquid

Proceed upon the hand board *by carefully matching the colour* of the sample by using the palette knife and the various p gments noting the quantities by bulk of each ingredient Into one of the buckets place measured quant ties of the white and various colours as determined by experiment upon the hand board Add a little petrifying l quid and mix the whole together Then add the remainder of the l quid until the paste colour has been increased by one third of its bulk Strain in order to bring about a thorough mixture of all the ingred ents

W th a fitch brush out some of the colour upon a piece of card board or better still upon a small selected section of the surface to be coated (Fig 25) Allow at least twenty four hours for this to dry, and then compare with the sample which has been matched Make any necessary adjustments of tone and hue re strain the distemper and proceed with its application

In making tinted washable distempers should the paste p gments not be available and dry p gments have to be used the latter must be ground up with petrifying liqu d upon the hand board by means of *the palette knife before adding to* the bulk white otherwise there can be no perfect un on

Testing Tone

In matching type 2 (in dry powders) small quantities of the dry powders are tempered up in water *on the hand board with the palette* knife in order to ascertain how much of each is required to obtain a match The necessary quantity of each is carefully measured out and all mixed together dry Then the whole quantity can be wetted in one operation The water should be *added slowly stirring all the* time until a smooth creamy mixture is obtained This is strained through cheese cloth A test is made for correctness of tone and hue by brushing out a sample as indicated for type 1 Twenty four hours should be allowed for drying and comparison then made *with* the sample If corrections are necessary each powder colour must be tempered up in water separately upon the hand board before add ng to the bulk of the distemper in the bucket

Method for the preparation of surfaces to be treated in washable

distemper or water paint All surfaces which may be treated in glue-bound distempers are generally suitable for the application of this type of material All are thoroughly cleaned of foreign matter by washing and scraping

To treat new lime plaster surfaces that have been coated with glue-size, first remove the latter by washing with hot water, otherwise there is danger of the finished distemper flaking from the surface With a flat brush lay in the surface with hot water, scrub with the side of the brush, and take off with a sponge and clean water Allow the surface to dry Remove all roughness by going over the surface with glasspaper, dust down and apply one coat of the petrifying liquid supplied for the dilution of the particular proprietary brand which is to form the finish

Repairing Cracks

For any repairs necessary to cracks formed by settlement of the fabric, or by vibration of the structure, rake out with a chisel knife or a shave-hook, slightly undercutting the edges After dusting out dry, wet these with the liquid and fill with a paste made from the paste white and plaster of Paris in equal quantities Press this into the cavities and remove all excess from the surface with a broad knife When dry, re coat all the patches with the liquid

For the coat following the preparation, make the distemper from paste colour (three parts by measure) and petrifying liquid (one part by measure), for the second coat use four parts of paste colour to one part of liquid

Lime plaster surfaces which have previously been covered with glue-bound distemper require somewhat different treatment All the old distemper must be removed by laying in the surface with hot water This is applied with a flat brush, allowed to soak, scrubbed with the side of the bristles and removed with the flat brush The surface is again laid in with hot, clean water, scrubbed and taken off with a sponge All traces of the old glue-bound distemper must be removed

Final Preparations

If this is found to be impracticable, the surface is allowed to dry and given a coat of very thin oil paint made from paste white lead ground in linseed oil, paste driers, slightly above the normal in quantity, with refined linseed oil and white spirit in equal proportions When dry, make good any necessary repair in the manner prescribed for hard plaster surfaces The surface is now ready to receive the first coat of the distemper

If the previous part of the treatment has not been necessary, the old distemper having been wholly removed by washing, any repairs which are required are carried out as for new lime plaster surfaces When dry, apply a coat of petrifying liquid, wait forty-eight hours, and then follow with the first coating of washable distemper

Hard Surfaces

For Parian, Keene's and other hard plaster surfaces that have been recently rendered, the only preparation necessary is to glasspaper and dust down Should they have been standing untreated for some time, they are liable to have deposits of grease on them, since they are non-porous This grease is removed by washing with a weak

solution of sugar soap, using a flat brush and taking off with a sponge and clean warm water

Cracks may also have developed through settlement of the fabric These are raked out, the edges slightly undercut with a chisel knife and shave hook, dusted and painted with thin, hard drying white lead paint When dry, the cavities are

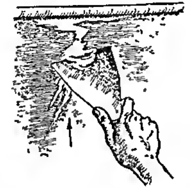


Fig 26. Removing with a broad knife excess filling material from a surface.

filled with paste made from the paste distemper and Keene's or similar hard plaster in equal quantities The material is pressed well home and all excess removed from the surface with a broad knife (Fig 26) As soon as this is set, paint with thin hard-drying white lead paint Allow time for drying then follow with the first coat of washable distemper

Painted Surfaces These are non porous surfaces and suitable for the application of washable distempers, providing they are hard and free from tackiness

Wash down with a weak solution of sugar soap to remove all deposits of grease, cut down the surface with medium grained waterproof abrasive paper, and sponge off with clean water Rake out all cracks, slightly undercutting the edges, remove all dust and paint the hollows with thin, hard drying white lead paint When dry, fill with a paste made from Keene's or other hard plaster and paste distemper in equal quantities, press well into the cavities and remove all excess material with a broad knife As soon as this stopping is set, paint with thin, hard-drying white lead paint When the paint is dry, coat in the whole surface with petrifying liquid

Pumice Stono

As each patch is laid in and still wet, cut the surface of the paint with the abrasive action of lump pumice stone and lay off with the flat brush, working in all directions Take care not to allow the edges of the patches to become set, or un sightly ridges will develop Follow with the specified number of coatings

Should the paint-work be old and cracked, the recessed portions on either plaster or timber surfaces can be filled to give a smooth even surface After laying in with petrifying liquid and breaking the surface with pumice stone, stiff paste dis temper is laid on to the surface with a broad knife and the excess removed with the same implement

Paint Removers

If old paint work is tacky, the whole film must be removed with one of the liquid paint removers, as prescribed in the section dealing with oil painting The preparation of the uncovered surface is the same as for a hard plaster or painted surface The oil from the previously applied paint film will be found to

have penetrated the surface and rendered it non-absorbent.

Paperhangings, plain and patterned, provided they are firmly attached to the surfaces upon which they are applied, form good grounds.

If the papers are not butt-jointed, cut the overlapping portions level by the use of glasspaper (Fig. 27). Dust the surface down dry and give the whole a coat of petrifying liquid, to which has been added paste distemper in the proportion of one part of solid to ten parts of liquid. Apply this evenly over the whole surface with a large flat brush. The paper may rise up in small bulges, but these will flatten out upon the evaporation of the water content. Allow forty-eight hours, and then proceed with the specified coatings.

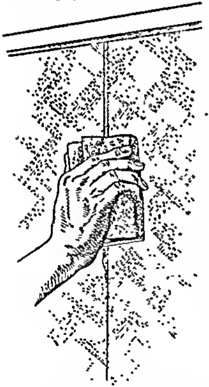


Fig. 27. Overlapping portions of paperhangings that are not butt-jointed should be levelled by the use of glasspaper.

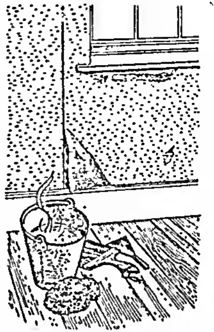


Fig. 28. Should the paper be loosely attached, it must be stripped with a knife.

If the paper is damaged or loosely attached it must be removed by soaking with water and stripping with a broad knife (Fig. 28). The surface is then laid in with hot water, scrubbed with a stiff flat brush, and sponged off with clean water to get rid of all traces of size and paste. The subsequent treatment of the surface is the same as that already described for its type.

Paper Lining

Paper forms possibly the best ground for the application of washable distempers and water paints. In the best type of work all surfaces, plaster, hard plaster, and paintwork, are therefore lined with paper. The preparation of these

surfaces before the paper is applied has been dealt with earlier in this chapter

Surfaces which have been previously finished in washable distemper are generally in good condition and simply require washing with a weak solution of sugar soap in order to render them suitable for the one or two coats specified

On timber surfaces, washable distempers are not applied as a normal practice, however, there are special conditions for which their use can be advocated

To obtain a finish for timber structures of a temporary character, as in exhibitions, remove all foreign matter from the surface with a broad knife and glasspaper All knots and sappy portions require attention Remove all exuded resin with the broad knife and wash such surfaces with commercial alcohol or methylated spirit or, if available, with clear alcohol

Patent Knotting

Apply to these portions two thin coats of patent knotting or shellac dissolved in commercial alcohol Dry glasspaper the whole surface, dust down and prime with petrifying liquid to which has been added one in ten parts by measure of paste colour Allow at least forty-eight hours for this to oxidise and lose its water content by evaporation

Stop or fill all broken portions cracks, and nail holes with a paste made from paste colour and hard plaster in equal parts pressed well into the cavities with putty and chisel knives Remove all excess from the surface

Follow up when the stopping is set with one coating mixed from paste colour (three parts) and liquid (one part) The final coating is applied twenty-four hours later, and is mixed from four parts of paste colour and one of liquid The coatings are applied in the same order and manner as though oil paint were being used, always passing the brush over the work for the last time in the same direction as the grain of the wood With care in application and adequate glasspapering between the coatings, washable distemper finishes form a good ground for the application of varnish, gloss finishes and enamels

Preventing Oil Paint Blistering

An effective preliminary treatment for timber surfaces upon which the applied oil paint blisters when subjected to the direct action of the sun, is made by removing the faulty paint film down to the bare wood, glasspapering, and applying two thin coats of washable distemper before the new oil paint At least forty-eight hours must be allowed between the coats and the same time before the oil paint is applied

All washable distempers are more or less fire retardant Hence they are suitable for the painting of all structural timbers to roofs and top-floor ceilings before these are covered with slates or plaster Two coats are generally sufficient, the first coat with the material hot This liquefies the distemper and effects better penetration of the surface For the first coat the proportion of the parts should be two of paste colour to one of liquid and for the second, three of paste colour to one of liquid This builds up a film of greater thickness

The special fire-proofing materials obtainable under proprietary names from most paint

merchants are of a similar character Most of them contain asbestos and a non flammable fixing agent of one of the silicates soluble in water

Such materials must be applied as directed by the makers

Distemper Application

The normal procedure in applying washable distemper is similar to that described for the ordinary glue bound variety The brushes used are as large as can be conveniently manipulated within the area of the surface to be coated Their bristles should form a compact mass, as they have to carry and extend a material with a liquid content less colloidal or jelly-like than glue-bound distemper and more heavily loaded with pigments

When the material has been made in sufficient quantity and the preparatory processes carried out, the available scaffolding should be so arranged that only minor adjustments will be necessary during the completion of the whole surface All fitments and furniture must be covered with dust sheets and windows and doors closed to draughts which hinder evaporation

Starting Place

Application commences at the lightest part of the room Edges must be cut clean and a good full coating laid on evenly extended with long swinging strokes of the brush in all directions This should be evenly carried along the whole width of the area in such a manner that the progressing edge does not become set before the adjoining patch is worked in Upon completion as much ventilation should be obtained as possible Any spots which may have been made should be cleaned up with a sponge and a weak solution of vinegar and water

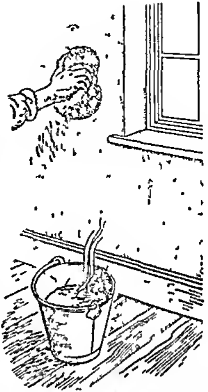


Fig 29 Sponging down with clean warm water a washable distemper surface two months after application

After use, the brushes must be thoroughly washed in soap and hot water

The surfaces of washable distempers and water paints can be satisfactorily washed two months after they have been applied, providing the materials were used in the manner and form recommended by their manufacturers

Make a weak solution of sugar soap and water, lay this on to the surface evenly and regularly with large flat brushes For application to walls commence at the bottom Do not scrub with the brush nor allow the surface to become dry

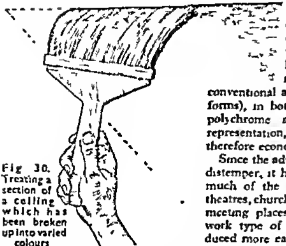


Fig 30. Treating a section of a ceiling which has been broken up into varied colours

during application Allow to stand for a few minutes then take off with a sponge and clean, warm water (Fig 29), repeat the process if very dirty While still wet dab the surface with a clean damp cloth and leave it to dry naturally

For decorative purposes distempers are a cheap and effective means of satisfying the æsthetic appeal necessary in most work after the purely utilitarian requirements have been met

The simplest treatment is to break up the area concerned into large masses differing in colour as in the panel and stile treatment of ceilings and walls (Figs 30 31) and in its modern trend the painting of each wall or pair of walls a different colour Its natural characteristic is to dry flat (without gloss) so that the full character of the colour and ornamentation is obtained without the impingement of reflections and glare incidental to a glossy finish.

As a medium distemper is specially suited for decorative detail executed in free brush work Lining, arabesques (free ornament built up from conventional animal and vegetable forms), in both monochrome and polychrome and in naturalistic representation, are rapidly, and therefore economically, executed

Since the advent of the washable distemper, it has been utilised for much of the decorative work in theatres, churches and other public meeting places The free brushwork type of decoration is produced more easily in this than in some other media in that the colours dry the same tone and colour as when applied Stencilling, with both positive and negative stencils and decorative detail produced by the use of masks and formerly executed in oils, can be and are produced with equal facility in distemper, and with the added advantage that they dry flat'

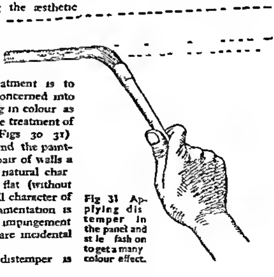


Fig 31 Applying distemper in the panel and stile fashion to get a many colour effect.

CHAPTER V

VARNISHING

TYPES AND USES OF VARNISH. PREPARATION OF OIL VARNISHES. PREPARING A SURFACE. VARNISHING TIMBER. PAINTED SURFACES. RE-VARNISHING. APPLYING OIL VARNISH FILM. APPLICATION OF SECOND COAT. HAND POLISHING OF OIL VARNISH. PUTTING ON A COAT OF FLAT (DULL FINISH) VARNISH. WAX FINISH TO TIMBER SURFACES. PSEUDO-LIMED FINISH

VARNISHING is the application of a transparent film for protecting surfaces from mechanical damage and disintegration by the destructive actions of atmospheric humidity and acid-laden vapours. In most cases, it is a firm, substantial skin which will withstand considerable abrasive action and is reinforced against easy dissolution. It is smooth and glossy, these qualities being valuable for keeping surfaces clean.

Improves Colour

When used upon coloured surfaces or upon polychromatic decorations, varnish enhances the hue or colour value and deepens the tone.

In present day practice, the decorator depends solely upon prefabricated varnishes, and from these he selects, either by recommendation or from past experience, the type best fitted for the job he has to execute.

The oil varnishes are the most useful class and are subdivided into hard for internal use, and elastic for external work. They are further classified according to their degree of transparency, from crystal clear to black japan. The following list indicates the scope of these subdivisions.

White coburg. For use upon white or pale colours. Hard for inside use, elastic for outside.

White oil. For inside use only, mainly over white or light coloured graining.

Pale copal carriage. For outside use.

Fine copal maple. For inside use.

Pale copal oak. Hard for inside, elastic for outside.

Fine copal oak. Hard for inside, elastic for outside.

Dark oak. Hard for inside, elastic for outside.

Hard oak. For inside use only, usually upon seats, etc.

Floor varnish. Specially tough to withstand excessive abrasive action.

Flatting varnish. For undercoating. Dries with a glossy finish sufficiently hard to withstand cutting down with glasspaper and water twelve hours after application.

Also a flat varnish which dries with a dull matt finish.

Black japan. For metal work.

Brunswick black. For metal work.

Water varnishes have a somewhat limited and specialised use, not directly connected with painting and decorating, except for the

protection of distemper printed paper bangings

These varnishes are made from gum soluble in hot water, such as gum arabic and other matter obtained from both plants and animals After abstraction refine ment end dilution these form jelly-like substances which are capable of considerable extension into a film This, after the evaporation of the water content still forms a continuous skin firmly attached to the surface upon which it has dried, and is impervious to oil Borax is added to prevent decay and assist in hardening the coating

Shellac in Alcohol

Spirit varnishes are also very little used by the painter except in the form of knotting These materials are made by dissolving shellac in commercial alcohol The solution is obtained without heat by the agitation of the shellac and spirits within a cylinder to which is imparted an eccentric movement The mixture dries by the evapora tion of the alcohol and the deposit of the shellac as a continuous film The dry film is impervious to the resinous secretions exuded by certain timbers which exert a solvent action upon linseed oil

Spirit varnishes also isolate surfaces which are impregnated or coated with materials harmful to superimposed oil paint, generally coal tar products Formerly they were used as protective films to prevent the oxidation of metals applied in leaf or bronze powder form but they have now been re placed for this purpose by clear cellulose lacquers (Fig 1)

Oil Varnishes

Oil varnishes are made from a drying oil reinforced with a resin and diluted with a spirit Linseed is the drying oil generally used The reinforcing resins may be the fossilised resinous exudations of trees of past ages or of trees still growing or they may be synthetic resins The thinner may be genuine turpentine or white spirit with an evaporation rate similar to that of turpentine

The fusion of the various in gredients is brought about by heat ing and stirring The resin content is pulverised and digested with a solvent alcohol in a large iron pot or container, the oil is added and the container placed over a fire The heating and boiling is a lengthy process throughout which the temperature must be carefully regulated During this period driers are added to stimu late and adjust the rate of oxidation in the finished article When thorough ad mixture has been obtained the pots are taken from the source

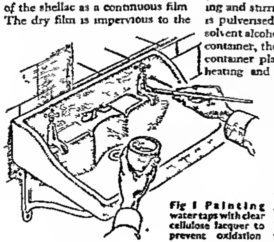


Fig 1 Painting water taps with clear cellulose lacquer to prevent oxidation

of heat and allowed to cool naturally

As soon as the temperature of the whole is reduced to the vaporisation point of the thinner, the necessary quantity of turpentine or white spirit is added and well stirred in After further cooling the varnish is strained by passing it under pressure through many thicknesses of a blanket like material to remove all foreign matter, or by the action of a centrifuge *spinning at high velocity* which deposits the solids as a hard film upon the outer casing The refined material is then piped to large vats for maturing

Formerly a long period was allowed for the settling out of any solids but now this is curtailed owing to the improved methods of straining It is, however, acknowledged that oil varnishes are improved with ageing *in bulk if an* even temperature of from 65 to 70 deg F is maintained

Chemical Change

In the drying of an oil varnish, a very marked chemical change takes place The oil content absorbs oxygen and becomes a tough and somewhat pliable solid This physical change is also helped by a slight evaporation of the spirit content and by polymerisation alteration of the atomic structure and consequent hardening of the film

In consequence, varnishes which have a large proportion of oil to thinner are naturally elastic and are termed long oil varnishes Where the reverse is the case the film is harder and the varnishes are termed short oil To assist in this hardening and to accelerate drying the drier content may be increased, thus renders all varnishes

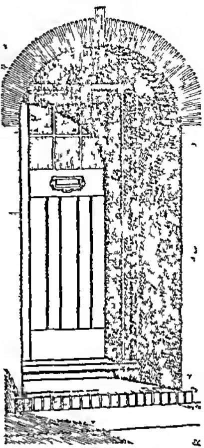


Fig 2. Doors exposed to sunlight are quite unsuitable for hard varnishes

which are termed hard unsuitable for surfaces which receive the direct rays of sunlight (Fig 2)

All varnishes must be used as received from the makers, they cannot satisfactorily be thinned with either turpentine or white spirit Stimulation of drying by the addition of liquid driers will always lead to a premature breakdown of the film

Varnishes should be stored in an even temperature which is never below 60 deg F, otherwise they will thicken and be difficult to

apply A high temperature renders them over-fluid or thin While this eases the labour necessary for their application, it reduces the thickness of the film and impairs its gloss

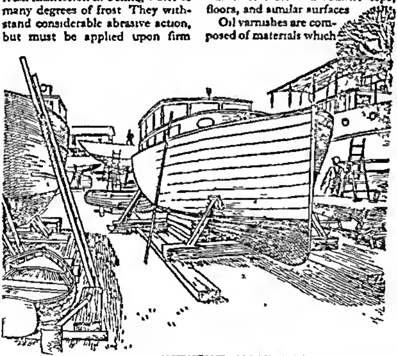
Damp Conditions

All elastic linseed oil varnishes are more or less influenced by humidity While normally producing excellent weather resisting films, abnormal conditions may lead to loss of transparency and eventual disintegration For many years past spar varnishes have been available These give really hard water-resisting surfaces, they will stand great changes in temperature, from immersion in boiling water to many degrees of frost They withstand considerable abrasive action, but must be applied upon firm groundwork, such as bare timber

These varnishes are made from tung oil, a vegetable oil reinforced with synthetic resins They have a solid form unaffected by local conditions Experience has enabled the correction of any physical disabilities they formerly possessed, so that the varnishes now available are thoroughly trustworthy

The main use for tung oil varnish is for work on ships' timbers, but it is also suitable for all other positions exposed to rough weather and great change of temperature (Fig 3) The dry film is not damaged by liquids, alcoholic or otherwise It is, therefore, a good finish for table and counter tops, floors, and similar surfaces

Oil varnishes are composed of materials which



VARNISHES WHICH WITHSTAND ABRASIVE ACTION

Fig 3 Tung oil varnish is used on ship-board and on surfaces exposed to wear, such as counter-tops and floors and where changes of temperature are met

adhere to any clean and stable surface, and do not depend upon penetration to produce that result Therefore, preparation aims at providing a non-porous, firm ground for their reception Their semi-fluid character allows for a certain amount of settling down by the molecules, by this means imparting a smooth even finish, which is either gloss or matt

Level Ground

This characteristic, however, exaggerates any departure from the even plane in the surface upon which the film is applied Hence the preparation must also provide a flat, even groundwork free from undulations, sudden changes of level and granulation A ground to receive a coating of varnish must be clean firm, and even, if full advantage is to be got from the valuable characteristics of the material

To distemper printed paper-hangings, the preparation commences with watching certain points in the preliminary stages of the work right from the plaster surface This must be smooth and free from nibs, any superficial repairs must retain the plane of the surface of the surrounding plaster as departure from this will be exaggerated in the finished job

Fixative Required

The paste used for fixing the paper must be clean and free from bits, it is best strained through cheese cloth before use The paper must be well rolled down special attention being paid to the pasting and adherence of the joining edges, which must be butted never overlapped (Fig 4) After hanging, ample time must be allowed for the evaporation of the water contained

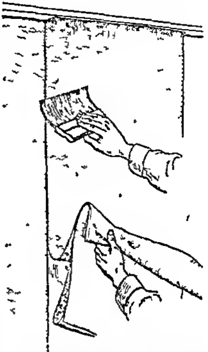


Fig 4 *Joining edges must be butted and not overlapped, when hanging papers that are eventually to be varnished*

in the paste and the fabric of the paper

A characteristic of oil varnish is that it imparts a permanent stain to both distemper and paper Hence during preparation an impenetrable film must be built up to prevent this happening The porous nature of the distemper and the paper is thus neutralised and isolation obtained by the application of two coats of size The size is made from animal or fish glue, the latter being the more transparent, it is reduced to a working consistency by soaking in cold, and dissolving with hot water When cold, the size should have the consistency of a trembling jelly

Apply with large flat brushes of soft hog hair Start from the bottom, and nearest the point

where light is admitted, if working upon a wall, and from the window side if upon a ceiling Lay on evenly with swinging strokes in all directions, and lay off with the strokes of the brush all in the same direction as the length of the paper Be careful to apply adequate size over the joinings of the various lengths and over any creases which may have been formed by the acute bending of the wet paper during the process of hanging

Well Dry Out

Allow the surface to dry by thoroughly ventilating the room, then re-coat similarly with size of the same strength as the first coat ing, but lay off at right angles to the finishing strokes of the first application This should prevent the possibility of any misses Ample time must then be given for the drying of these films before varnishing which should be undertaken only in a warm dry atmosphere of at least 65 deg F, otherwise the size may still be charged with moisture and the best results not obtained

Fig 5 Clean rag and white spirit should be used to take off linseed oil applied to splashes of tar or creosote.

Certain timbers possess an æsthetic value on account of their natural colour and characteristic markings Varnish is applied to enhance these and protect the surface from the action of the elements Pitch pine, extensively used in works, offices, and schools on account of its hard wearing qualities, is normally varnished, in some small measure to protect it from mechanical damage, but chiefly to simplify the process of keeping it clean

Although paint can be used for this purpose, a reinforced oil like varnish withstands better the solvent action of the particular resin contained in this timber All timber work to be finished with varnish requires particular care during its construction by the carpenter or joiner the final finish being given to it with a steel scraper, this cuts off the fur (fibre standing up from the surface) from the softer portions instead of raising it, as does the use of glasspaper

Remove all foreign matter such as glue, mortar, or plaster, with a broad knife If it is splashed with pitch, tar, or creosote, remove as much as possible of this with the broad knife, touch the spots with raw linseed oil, and take off with a clean rag and white spirit (Fig 5) From the flat portions, remove all fur with a carpenter's steel scraper, the drag of the tool must be with the set of the grain as in using a plane (Fig 6) If a scraper is not available, the straight, freshly cut edge of a piece of sheet glass is a good substitute

Pass over all mouldings with

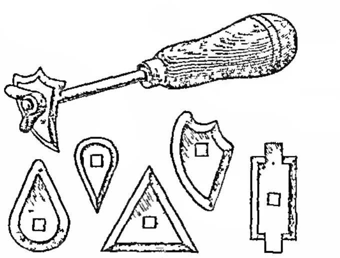


Fig. 7. Shave-hooks are used to clean off mouldings They are shaped to the contours by filing the blades.

ıave-hooks shaped › their contour by ling the blades Fig 7) Remove all ust with a dusting rush.

To overcome the ınevenly absorbent ıature of the timber, ıpply, with suitable ›rushes, a coating of either japanner's gold-size or flatting (cutting down) varnish, each reduced in viscosity by the addition of an equal bulk of genuine turpentine or white spirit to increase its penetrative power

Allow twenty-four hours for drying, then cut down the surface with felting paper, 00 or 000's in texture, with water as a lubricant, sponge off with clean water and leather down. When perfectly dry, apply a second coating of the same material, cut down this as described above The surface is now ready for the application of the type of varnish suitable for its situation and the finish desired.

In cheap work, after the removal of all foreign matter from the surface, a coating of animal or fish glue-size, preceded in the same manner as recommended for paperhanging, is given in place of the reduced gold-size or varnish. When dry this is cut down dry with fine grained glasspaper, dusted and recoated with size A slight rub-over with worn glasspaper and dusting then leaves the surface ready for varnish

Work executed in this manner always presents an uneven surface, through the moisture in the size raising and fixing in that position the softer and more absorbent portions of the timber.

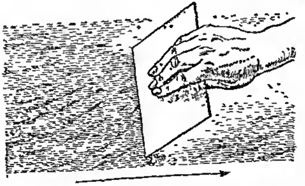


Fig. 6. From the flat portions remove all "fur" with a carpenter's steel scraper, working with the set of the grain.

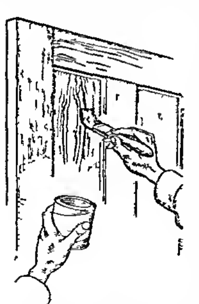
Certain red wood and other imported timbers which may be used in the erection of buildings contain resinous substances which have a very pronounced solvent action

upon superimposed films of paint or varnish These can generally be distinguished by dark-coloured cells somewhat irregularly spaced in the softer layers of the timber and running with the growth.

Applying Shellac

After the preliminary clean down and scraping such timbers are first washed with commercial alcohol by laying on the liquid with a soft haired brush scrubbing with a stiff bristle brush and taking off with a clean rag The surface is then given two thin coatings of shellac dissolved in commercial alcohol in place of the two coats of japanner s gold-size or flatting varnish recommended for other timbers (Fig 8)

In timber previously varnished the film will be darkened by oxidation and practically disintegrated by atmospheric action



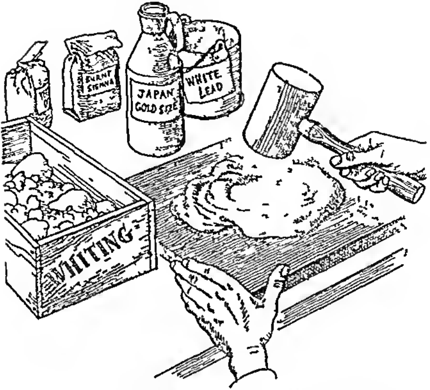
F g 8. Apply ng shellac dissolved in commercial alcohol to specified timbers.

Remove all the old varnish by means of a liquid varnish remover This is laid upon the surface with a brush several applications being made with short intervals between each coating The softened varnish film is then removed with broad knives and shave hooks When the surface is clear it is washed with white spirit laid on with a brush and taken off with a clean rag

As an alternative a fa rly strong solution of caustic soda is made by adding three pounds of caustic soda to one gallon of cold water placed in a bucket The soda is added a little at a time because contact with water develops heat with cons der able ebullition and this material should be handled with care as it will burn the human skin It should be applied to the surface with a fibre brush, as bristles will not withstand its caustic action When the film has been dissolved it can be removed by washing down with clean water

While the surface is still damp lay in with a solution of oxalic acid this will neutral se any soda which may have penetrated the fabric of the timber and at the same time bleach the surface Allow this to dry and then wash off with clean water and again allow ample time for drying When a solvent has been used which is itself soluble in water the fibre of the timber is raised and its surface roughened A smooth level finish is obtained in such cases by the use of the steel scraper as indicated for new timber

After the removal of the old film by one of the processes indicated a primer coat is applied consisting of japanner's gold-size or flatting varnish thinned by the addition of



HOLES FILLED WITH HARD STOPPING

Fig 9 Stiff paste is made of white lead wh ting and japan gold-size coloured with pigments to match the timber the whole being finally beaten with a mallet

an equal quantity of white spirit Twenty four hours are allowed for drying and hardening and then the surface is cut down with fine grained glass emery or garnet paper and dusted off with a dry brush

All holes cracks and open joints are filled with hard stopping This is a stiff paste matching the general colour of the timber made from paste white lead whiting the necessary dry pigments and japan ner s gold size All these materials are worked together on a hand board with a stiff bladed broad or chisel knife and finally beaten with a mallet (Fig 9)

This stopping is pressed into the cavities with a stiff bladed chisel knife and all excess taken from the surface with the same tool Time is allowed for the hardening of the material and the patches are then coated in with the primer used upon the whole surface When this is dry the latter is again glass papered and dusted off and the application of the varnish follows

Special Care

All the operations necessary for building up the painted ground work require carrying out with special care when the *specified* treatment ends with the words and varnished Carelessness in filling intercoat glasspapering and brush manipulation cannot be

corrected by the application of a transparent film of varnish Faults which appear negligible in a semi-gloss paint finish become obvious when they break the evenly smooth and glossy finish of varnish

Dry Undercoatings

All the undercoatings must dry hard and firm, have no marked difference in the proportions of the ingredients which form adjacent films and finally produce a stable, even surface without gloss

This having been obtained, lightly rub with worn glasspaper to remove any small nibs caused by the adherence of dust while the paint was still wet, and remove and collect the dust caused in this process by passing a damp chamois leather over its surface If the final coat of paint has dried with a glossy finish, the gloss must be completely removed by cutting down with fine grained waterproof abrasive paper, lubricated with water in the manner indicated for cutting down old gloss varnished surfaces which require re varnishing

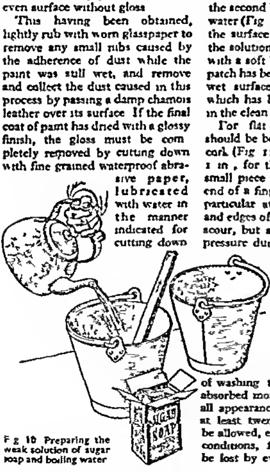


Fig 10 Preparing the weak solution of sugar soap and boiling water

When dealing with old varnished surfaces (woodwork) to be re varnished, the requirements will be two buckets, well-worn clean brushes, fine-textured waterproof glass, emery, or garnet paper, sponge and leather, sugar soap or dry soap

In one of the buckets make a weak solution of sugar soap with hot water and allow to cool, fill the second bucket with clean warm water (Fig 10) Commence wetting the surface from the bottom with the solution of sugar soap, applied with a soft bristled brush. When a patch has been laid in, cut down the wet surface with abrasive paper which has been previously soaked in the clean water

For flat surfaces, the paper should be bent round a flat slab of cork (Fig 11) measuring 4 by 3 by 1 in, for the mouldings, bend a small piece of the paper over the end of a finger or the thumb Pay particular attention to the angles and edges of the flat panels, do not scour, but apply even and steady pressure during the whole process to obtain even granulation of the surface Wash off with a sponge and clean water and finally leather When dry, the surface should have an even, dull finish free from nibs

During the process of washing the varnish may have absorbed moisture, and though to all appearances it may seem dry, at least twenty four hours must be allowed, even under favourable conditions, for this moisture to be lost by evaporation After this

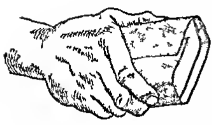


Fig 11 Abrasive paper wrapped around cork for use on old varnished surfaces

interval the varnish may be safely applied

All varnishing should be done in a warm atmosphere All dust must be removed from the vicinity of the work Brushing up and dusting should not immediately precede the application of varnish as this fills the air with particles of dust ready to adhere to the first sticky object they encounter Have all the dust and dirt removed the day previous and if possible the floor washed, keep doors and windows closed to prevent draughts, keep out all who are not varnishing and move about quietly Never attempt to varnish while other tradesmen are working in the same room while the walls are being papered or while the room is being used as a general thoroughfare

Dust Prevention

For external varnishing a quiet day should be selected or the varnish will be rough The ground in the vicinity should be sprinkled with water to prevent the raising of dust by passing traffic but this need not be a wholesale wetting

The procedure has been explained for preparing various grounds so as to present the non absorbent, finely textured and dull surface necessary to obtain the maximum length of service and æsthetic satisfaction from oil varnish The material itself requires equal care in storage and conveyance

Oil varnish is supplied to the painter in sealed metal containers of from half pint to two gallons capacity These make it possible to select and open just sufficient for immediate requirements, an important factor in its economical use Oil varnish soon ' fattens up (thickens) when a badly stoppered container allows contact with the air, and in that state it covers less ground and requires more labour in its extension

Most manufacturers indicate how many square yards can be satisfactorily covered with a gallon of their product This normally works out at from eight to ten

Fig 12 Mouth of can should be wiped to avoid dust coming into contact with the varnish whilst pouring it out

square yards per pint, the full bodied material covering the former and the free-working variety the latter area Varnish is more viscous and difficult of extension on a cold day, a temperature of from 65 to 70 deg F is best suited for both storage and application

The container is taken to the vicinity of the work twenty four

hours prior to opening it, in order that the material it contains and the surface upon which it is to be applied shall be of approximately the same temperature All dust should be removed from the outside of the container, which is then carefully opened one hour before use (Fig 12) The can or pot into which it is then poured must be scrupulously clean and free from dust and the pouring should be done slowly so that any sediment is not disturbed and remains behind with the last dregs left in the container

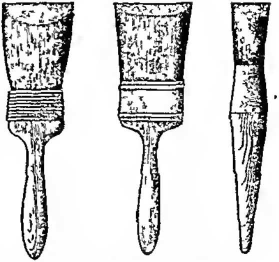


Fig 14 Varnish brushes used for the application of material on finished surfaces should be made of selected hog bristles and bevelled to a chisel edge

For the best type of work, the varnish is strained during the operation of pouring out A piece of fine cambric or silk is securely fastened over the vent and the container inverted over the can or pot, the refined liquid passes through by gravitation only, and leaves behind all grit, coagulations, and other foreign matter (Fig 13)

Fig 13. Straining the varnish before use to eliminate grit and clots is necessary for the best type of work.

Brushes for the extension of the film require to be substantial, they are built up as a compact mass of fine hog bristles and of greater bulk than painting brushes (Fig 14) In use, this permits added pressure and more even distribution in the laying of the film Such brushes are generally termed ground brushes, as after the assemblage of the bristles in the stock, the bunch of hair is given a blunt chisel like form to make it ready for immediate use without any preliminary breaking in

Make sure the brush is clean and free from grit before working it into the varnish Do not plunge it into the liquid and work it up and down, as this would fill the varnish

with small globules of air which would prove annoying in the extension of the film and be liable to spoil the finish

The correct way to start is to dip the bristles of the brush carefully into the varnish, withdraw, and extend the quantity taken up by brushing to and fro with firm strokes upon a clean board (Fig 15) Alternatively, varnish some inconspicuous section of the work

Fig 16 Applying the correct method of finishing off the work in hand after covering a small patch with varnish

In laying the film, flow the varnish on in a good body Do not rub it out at all, merely lay it evenly over the whole surface, carrying forward the wet edge without any break in continuity Put on as much as possible without a tendency to sag or run When a small patch has been covered, pass the brush firmly over the surface at right-angles to the laying in, cross again and re-cross, finally laying off with firm strokes in the same direction as that in which the film was first laid on (Fig 16) Make no attempt to leave a smooth finish, a characteristic of varnish is that it flows together after its even extension with the brush

Fig 15. Careful dipping of the brush is essential

Second Operative Needed

If the surface is not a self-contained unit of space, commence laying in the next patch at the wet edge and carry on as before Should there be two wet edges to carry along because the space is too wide to carry along as one patch, a second operative will have to come into action, if very wide, three, four, or more men will be required as indicated in the diagram (Fig 17) Oil varnishes flow out and set in a short time This means that the area laid in at one time must be small in order that the flowing edge may be caught up before it has set, otherwise a ridge develops between the contacting patches

In varnishing a panelled door the procedure is similar to that for painting similar surfaces Each panel and its mouldings are to be treated as separate units, care being

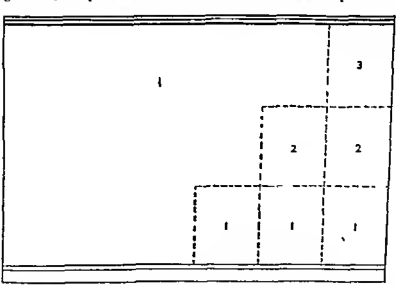
taken that the varnish does not accumulate in the corners of the panels or the crevices and quirks of the mouldings (Fig 18) The muntins, rails, stiles, and closing edge should be varnished in the order named Care is necessary to avoid excess of varnish at any sharp arris or angle and to see that no ridges develop where the various units contact each other

Full Gloss Varnish

When the specified treatment for a particular surface ends with "and varnished two coats," there is implied the treatment the first film of varnish requires before its surface is suitable to receive the second coating It has already been stated that for the satisfactory application of a full gloss varnish the groundwork upon which it is placed must be finely granulated and without gloss To establish this condition, treatment between the coats of varnish is necessary

The use of a full bodied varnish for the first coating requires a considerable interval of time to elapse before it is sufficiently hard for cutting down by abrasive action To expedite matters it is now the normal practice to apply for the first coating a flatting varnish. Within twenty four hours this hardens sufficiently throughout the film to withstand cutting down with fine waterproof abrasive paper and water The process has already been described in the treatment for an old varnished surface which has to be re varnished

If the finishing type of varnish has been used for the first coating at least a week must elapse before



HOW THREE MEN WOULD WORK ON A LARGE AREA

Fig 17 Oil varnish flows after its application and where a large area has to be covered, it is advisable for two or three operatives to work so that the flowing edge of each section is picked up The diagram shows how three men would do this.

it is in a satisfactory condition to be cut down for the application of the second film This preparation may be done by the abrasive paper and water method, or by the use of abrasive powders, felt pads, and water

The requirements for the latter method are two buckets, two large earthenware basins, ground pumice stone, felt rubbers, sponge, chamois leather, and water.

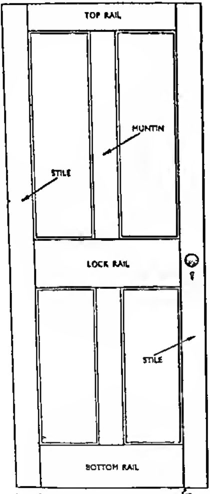


Fig 18. Each section of a varnished door should be treated as a separate unit.

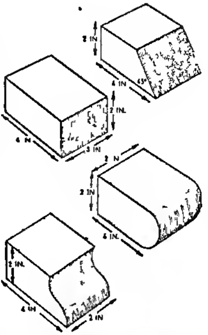


Fig 19. Pads of recommended shapes, made from tightly packed felt, for cutting down the varnish on mouldings

The ground pumice powder is first levigated by agitation with clean water in one of the basins, allowing to settle for one minute, then pouring into the second basin the pumice still held in suspension by the water and allowing it to settle out until the water is clear The clear water is then poured off and the remaining paste is the abrasive

The felt pads are made from tightly packed felt (engine pads) which can be cut to the shapes required with a fine tenon saw and gouges One should be 4 by 3 by 2 in , a second 4 by 2 by 2 in , with one end bevelled at 45 deg , and several 4 by 2 by 2 in with the ends carved to the contours of the moulds (Fig 19) The felt pads should be soaked in clean water

Wet the surface with the sponge

and clean water, spread a little of the pumice paste upon the surface of the wet felt and apply to the surface of the varnish with a circular motion Commence at the outside edges and corners of the panels and

Fig 20 During short breaks cover varnish and brush with a clean paper

work towards the centre In order to avoid tearing and heating the surface, exert even but not vigorous pressure until the desired fine grained surface is obtained If no facilities exist for cutting the felt pads to the contours of the curved mouldings these surfaces can be cut down with a little of the abrasive spread upon soft felt or cloth

After cutting down, thoroughly wash the surface with water and a sponge to remove all grit, and leather off Allow at least forty eight hours before re-varnishing

Care with Brushes

While varnishing is in progress do not lay down the brush in places where it is liable to pick up dust During a short break, stand it in the varnish and cover the pot or can with clean paper or rag (Fig 20) When work is resumed remove the excess of varnish from the bristles of the brush by passing them under the blade of a palette knife held over the container (Fig 21) During a long break, for example, at the end of a day, suspend the brush in the same type of varnish to which has been added an equal bulk of turpentine or white spirit, and cover with clean paper or rag (Fig 22) The liquid must cover the whole of the exposed bristle, but not the stock of the brush

When required for use again, *carefully remove all* the *thinned* varnish from the bristles by using a palette knife as indicated above and rub out on a piece of clean paper Take a dip from a new supply of varnish and work the brush in upon some inconspicuous part of the work Place the thinned varnish in a container with a good stopper and retain it for use as a

Fig 21 Brushes must be cleaned when job is finished and not put into linseed oil

medium in the mixing of oil paint as required

As soon as a varnishing job is finished wash the brushes with hard soap and hot water dry, and store them in a warm place free *from dust* (Fig 23) Do not stand varnish brushes in raw linseed oil, [illegible]ractice is liable to introduce [illegible] it into the varnish film and

cause patchy hardening and uneven gloss

The first requirement when hand polishing is an adequate film of oil varnish built up by the application of two or more coatings with careful cutting down of each surface in between Cut down the last coat to an even dullness with levigated pumice powder, water, and felt pads Allow time for the film to harden, then cut down with levigated rottenstone, water, and felt pads, this imparts a finer granulation to the surface Again allow time for the film to harden, and let some of the levigated rottenstone dry in a covered clean container to prevent access of gritty dust Replace the felt pad with a wad of cotton wool covered with soft worn calico and replace the water with refined linseed oil Charge the cotton wool with linseed oil place in the rag and twist into a pad (Fig 24) Upon the exuded oil on the surface of the rag place a little of the levigated and dried rottenstone With this proceed to impart a polish, using very slight pressure, and occasionally taking the oil from off the surface with cotton wool to observe progress

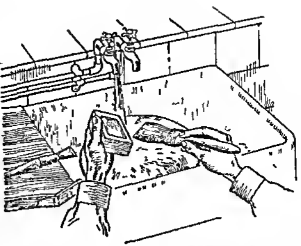


Fig 23 When varnishing is completed brushes should be washed and stored in a warm place free from dust

Fig 22. Suspending brush in varnish and turpentine and covering up for night

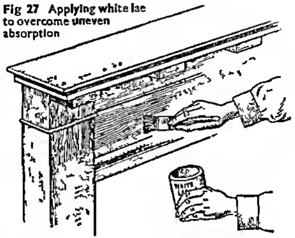
Final Polish

When as smooth a surface as possible is obtained by this means, wipe off clean with dry cotton wool Sprinkle household flour upon the surface and with loose cotton wool proceed to give the final polish, which will be full gloss and free from oiliness (Fig 25) All these processes must be done in an easy manner without heavy pressure to avoid heating the surface as this would impair its lasting qualities

The application of a coat of flat (dull finish) varnish is a finish in fairly general use upon brush grained woodwork With the usual daily dusting it acquires a semi-gloss appearance, which, together with its broken colour, hides the lack of finish which characterises much of the timber

cut down dry between each of the coatings with fine grained felting paper The final polish is obtained by the application of a good quality floor or furniture wax polish also purchased ready for use This paste is spread over the surface with a soft cloth rubber and polished with soft-haired brushes and soft cotton cloths

Fig 27 Applying white lac to overcome uneven absorption



The stripping of old oak wainscot which had been painted possibly in Tudor times revealed that the preliminary stages of the work had been executed in a distemper medium which resisted the action of the solvents employed and could only be removed with steel scrapers The use of these still left the white filling in the characteristic check markings which are normally dark coloured in the natural wood

The decorative and æsthetic value of this was appreciated and in many cases retained without further treatment In others the unevenly absorbent character of the surface was corrected by coating with bleached lac

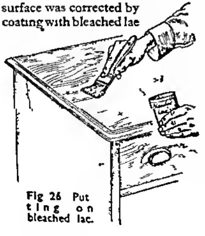


Fig 26 Putting on bleached lac.

dissolved in commercial alcohol or with button polish and wax polished

This effect is now reproduced upon new timbers of many types

The surface of the new timber is prepared (by the removal of all roughness with steel scrapers etc), and given a coat of thin white lac in solution or button polish to overcome the uneven absorption (Fig 27) The surface is then cut down with fine grained felting paper washed with clean water and a sponge to remove all dust from the hollows and check markings and leathered off

Upon a hand board stiff washable distemper is worked up into a smooth paste and applied to the prepared surface with a stiff bristled brush the material being worked well into all the crevices

The paste is removed from the surface with filling knives so that it remains only in the hollows of the check markings At least forty eight hours must be allowed for the hardening of the distemper The surface is cleaned with fine grained felting paper dusted off and a coat of thin bleached lac dissolved in commercial alcohol is then applied

CHAPTER VI

STAINING AND ENAMELLING

TYPES OF STAIN FUNGOID GROWTHS ON TIMBER TIMBER TREATED WITH TAR AND CREOSOTE CHOICE OF PROTECTIVE MATERIALS, STAINING TIMBER WITH OIL AND WATER STAINS FLOOR STAINING DECORATIVE USE OF STAINING GLAZING GRAINING DULL FINISH ON PAINTED DECORATION SCUMBLING SHADE EFFECTS COLOURED VARNISHES ENAMELLING RE-ENAMELLING A BATH

Staining is the alteration of the natural colour of timber without obscuring its characteristic markings By the general public and by many painters this is considered its most important use That it may have some decorative value and, in some measure, afford protection from mechanical damage is also acknowledged

Protecting Timber

In modern practice, its latest development, the protection of timber from destruction by insects and fungoid growths, has become a very important function From the time the process of distillation was first evolved, some of the by-products obtained in the distillation of wood, coal and shale have been used by craftsmen to protect timber exposed to the action of the elements Of these by-products painters are familiar with tar and creosote as regards both appearance and the scope of their useful application

Biologists have learned much about the nature and life histories of fungoid growths and insect pests destructive to dead timber Their knowledge, combined with the work of chemists in the refinement of distillates and the development of synthetic dyestuffs, has made possible the production of materials for the destruction of these vegetable and animal pests

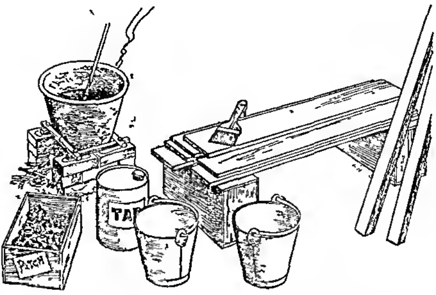
Liquids of various kinds, combined with certain metallic salts which are toxic to vegetable and insect life, have been manufactured, both clear and dyed, in a considerable range of colours Some impart the final finish others dry hard superficially and leave a surface upon which oil paint and varnish can be safely applied

Among the older types of staining, there is one known as chemical staining In this, the timber is subjected to the fumes of ammonia The necessity for fume chests of considerable size limits the use of this process to factory-produced articles A similar tone and colour can be given to certain specified timbers by coating their surfaces with liquid ammonia

Diluted Pigments

For pigmental staining, lakes or transparent pigments such as siennas, umbers, vandyke brown, and Prussian blue are ground into paste form with water or linseed oil They are diluted with appropriate materials to render them suitable for application with a brush

The colouring principle of stains is dyestuff which is obtainable in



TREATING TIMBER WITH TAR

Fig 1 Before the actual work commences collect the materials and tools required and construct a brick fireplace upon which an iron boiler will securely stand

the form of powder or crystals to be dissolved in a water or spirit medium

These types of staining possess little body or film-producing content To a certain extent they harden the surface, but they offer little resistance to mechanical damage or atmospheric action To compensate for this lack, varnish is generally superimposed

When tarring rough-sawn timber, it will be found that tar obtained from the gas works is generally thin, its penetrative power is good, but it is incapable *of building up a substantial film* It is, therefore, the best policy to apply two coatings, for the first using the tar as obtained, and for the second reinforcing it with pitch or bitumen

All timber must be dry on application, as imprisoned moisture only promotes premature decay

Before the actual tarring commences, we shall need an iron boiler with sufficient firebricks to support it in position so that a fire may be kindled under it, several buckets, tar, pitch, brushes, and supporting boxes (Fig 1)

Heat the tar as obtained over the open fire and apply liberally to the surface of the timber with somewhat coarse-haired brushes Most of the material will be absorbed and the surface stained brown Allow two days for setting Prepare the second coating by heating the tar and adding pitch The quantity *of pitch should be about* one-eighth that of the tar by bulk for vertical surfaces, and twice that proportion for roofs Stir until thorough incorporation takes place and apply with brushes while the material is still hot

Maximum protection for hoardings and fences is obtained only if

the portions of the standards to be buried in the ground are first dipped in reinforced tar (Fig 2) All worked portions and parts of the framing which will be covered by overlapping must be coated before or during construction

Protecting Timber

The creosote in general use for the protection of sawn and planed timber is an oil fluid obtained by the distillation of wood in the production of carbolic acid It is thinner and paler in colour than gas tar It is very penetrative and on account of this characteristic appears surface dry in a short time, but still remains greasy to the touch

It exerts a very pronounced solvent action upon superimposed oil paint or varnish; it is therefore generally reserved as a finish for structural timbers, trellis-work and so on Superficially it weathers with ageing External timbers are, therefore, re-coated every five or six years It affords a considerable measure of protection against fungoid growths (dry rot) to all timbers in humid and badly ventilated situations It should be applied to the whole of the surfaces of joists and struts, and to the under-sides of floor-boards of all the ground-floor rooms of new property

Buckets and working cans, brushes, and creosote, with facilities for heating, are the requisities

Application of Creosote

Before proceeding, see that all the timber is dry, then scrape off all the mortar and foreign matter with a chisel knife and dust down with a dry brush Heat the creosote and apply in a good flowing coat giving the surface all it will take up without the material running down and off the surface Two days are necessary for this to sink in, then re-coat with the creosote as obtained, and not heated

When re-coating timber which has been previously creosoted and now presents a weathered appearance, prepare the surface by rubbing with stiff wire brushes (Fig 3), dust off and apply the

Fig 2. Uprights that have to be buried in the ground should be dipped in reinforced tar to give full protection

fresh creosote cold It sometimes happens that the timbers of false "magpie" work upon exteriors which were formerly treated in creosote have now to be given an oil paint finish

To change the treatment from creosote to oil paint, scrub down the surface with stiff wire brushes and dust off, then put on one thin coat of shellac dissolved in commercial alcohol to obtain the maximum penetration, and follow with material containing a greater proportion of shellac to give body and obtain insulation

Fig 3 Previously treated timber must be prepared for the new coat by rubbing with wire brushes and dusting off

Destructive Pests

All timbers contain the food material required to nourish both fungoid growths and such pests as the death-watch beetle, furniture beetle, and ants, always provided the conditions are favourable for their development These insects normally begin their attacks from the outside, therefore, it follows that, if the external fibres can be impregnated to an appreciable depth with materials poisonous to such pests, the timber will be rendered immune from attack

A condition of paramount importance to painters is that such a material shall be capable of application by brushing Materials which fulfil both requirements are now obtainable under proprietary names

Immunity can only be assured if certain conditions are observed in the application of these materials All timbers used in the construction of roofs, whether finished by adze, plane, or carver's tool must be coated over the whole of their surfaces All worked portions, mortises tenons, and the end grains of butted lapped, or mitred joinings, must be treated before assembly The backs of wall plates and ends of beams resting upon masonry, brickwork, or concrete must receive adequate treatment before being placed in position

The same care and attention are necessary in the construction and erection of wall panelling, architraves, framework, and skirtings, which may make contact with moisture or be constructed of imperfectly seasoned timber

The materials themselves are made in different qualities respectively for external or internal use They may be clear or coloured and either provide the finish or leave a surface upon which ordinary oil paint, varnish, or gilding can be satisfactorily superimposed This latter is a very important factor in church work In all cases the instructions of the manufacturers must be carried out in their entirety

From the proprietary brands is selected the one most suitable for

the work in hand The seasoned timber must be surface dry at the time of application All foreign matter is removed from the surface with a broad knife or carpenter's scraper and the whole dusted off with a dry brush The material is applied in a liberal manner with large, soft bristled brushes, ample time is allowed for maximum penetration of the fibres, and final laying-off is done with the grain

After twelve hours, a second coating is applied in a similar manner If the material is coloured to impart a stain, the progressing or wet edge must be kept alive, or a darker patch will develop at each joining

In many cases the material is heated for the first coating

Oil Medium

For ordinary staining of timbers an oil medium is the most satisfactory in use and performance Clear, bright unclouded colours are easily obtainable their liability to mechanical damage is negligible and they form most excellent grounds for superimposed finishes

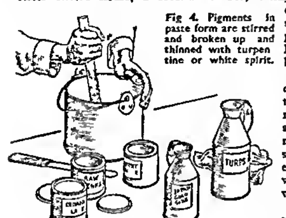


Fig 4. Pigments in paste form are stirred and broken up and thinned with turpentine or white spirit.

The material is obtainable in two forms It may be under a proprietary name, as a paste already containing the drying medium which simply requires dilution with genuine turpentine or white spirit to be ready for use, alternatively, it may be made from transparent or semi transparent pigments obtained as a stiff paste ground in refined linseed oil, raw and burnt sienna, raw and burnt umber, vandyke brown, yellow, orange, scarlet, crimson, mahogany, purple, and green lakes and Prussian blue being examples

These pastes require breaking up, together with japanner's gold size in a pot or can by means of a spatula or stirring stick, and be excessively thinned with turpentine or white spirit (Fig 4)

They should be strained through fine cambric or butter muslin to obtain thorough admixture of all the ingredients

Tests for colour and tone are made by brushing upon a piece of timber of the same type and finish as the ground upon which the oil stain is to be used This is allowed to stand for five minutes and then wiped off with a clean rag which removes much of the stain from the hard portions of the grain, by this means the value of its characteristic marking is enhanced

It is allowed to dry, and then if it is not dark enough the process is repeated Two or three coats of stain superimposed by this method will retain the markings, whereas

one coat heavily pigmented is liable to obliterate them

To carry out the work you will require several clean pots or cans a broad knife and carpenter's steel scraper large soft hair or bristle brushes the necessary proprietary paste stain or paste pigments japanner's gold size turpentine or white spirit and clean rags For making good hard stopping abrasive paper sponge chamois leather chisel and putty knives are needed

Foreign Matter

First remove all foreign matter with the broad knife and dust down with a dry brush then pass a carpenter's steel scraper over all the flat parts to remove the fur which may have been raised by the use of abrasive papers (Fig 5) The mouldings should receive similar treatment with shave hooks shaped to the contour of the mould Again dust off thoroughly with a dry brush

The stain should be applied liberally with a large soft bristled brush allowing time for penetration before wiping off with a clean rag In laying in large surfaces keep the progressive wet edges alive

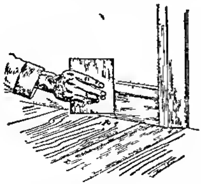


Fig 5 Using a steel scraper to remove all roughness caused by abrasive paper

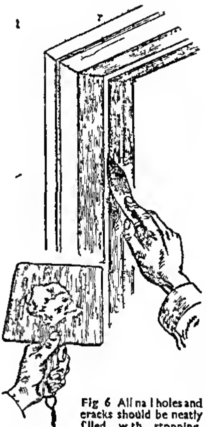


Fig 6 All nail holes and cracks should be neatly filled with stopping

to prevent dark patches developing where the various sections are worked one into the other In panelled and stiled work first complete the panels and mouldings up to the sharp arris of the framing Then cover the flat surface of the rails muntins and stiles as one unit It will need twenty four hours to dry and harden

Fill nail holes and crevices with stopping (Fig 6) made from white lead ground in linseed oil whiting the necessary dry coloured pigments required to match the colour of the stained timber and japanner's gold size Work this into a stiff paste with a rigid chisel knife upon a hand board and beat with a

mallet. Press the resulting stiff paste into the holes with the chisel knife or putty knife and remove all excess from the surface and allow twenty four hours for hardening

Cut down the surface with damp fine-grained waterproof abrasive paper, sponge off, and leather, using as little water as possible When dry, correct the uneven absorption of the surface by coating with japanner's gold-size, to which has been added an equal bulk of genuine turpentine or white spirit (Fig 7) Oil stained surfaces are subsequently covered with varnish to give full gloss, semi-gloss, flat or wax finish The method of obtaining these is fully dealt with in the chapter on varnishing

Raising the Grain

The staining of timber with water stains, satisfactory from a colour aspect, is liable to raise the grain of soft grained timbers, and will make the surface rough and

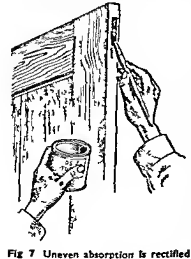


Fig 7 Uneven absorption is rectified with Japan gold-size mixed with turps

"fuzzy" For first-class results, thorough sanding is necessary

The materials used are obtained as powders or crystals These are dissolved in boiling water and reduced to a working strength with cold water The transparent or semi transparent pigments used for oil staining are procurable in paste form, being ground in water only, if they are in powder form they require grinding in water to obtain their full staining power, this can be done in a small cone mill, or by muller and slab if only a small quantity is required In cheap work the powder colour is tempered up in water with a palette knife upon a hand board.

The use of pigments requires a fixing agent The latter can be a very weak solution of a gum soluble in water (gum arabic), or size made from animal or fish glue or concentrated size This is first mixed with the paste pigments and then reduced to a working consistency with water only

The tools and materials consist of several clean pots or cans, broad knife, and carpenter's scraper, chisel and putty knives, large soft hair or bristle brushes, stain, size, japanner's gold-size, turpentine or white spirit sponge, chamois leather, and clean rags

Even Working

The timber surface is prepared as for oil staining by removing all foreign matter and the fur like fibre raised by glasspapering The stain is applied in a good flowing coat with large soft haired brushes Progression must be evenly carried out by always working from the wet edge and making no break until the whole unit is laid in Time must be allowed for the stain to impregnate

the surface thoroughly and laying - off when done with the grain of the wood

Water staining does not overcome the absorbent quality of the timber, so the next procedure when the water stain is quite dry is intended to counteract this The better method is to lay in the whole surface with japanner s gold size which has had its bulk increased with an equal quantity of genuine turpentine or white *spirit (Fig 8)* In cheap work this is replaced by a coating of weak jellied glue size This process is unsatisfactory, as it interposes a film which prevents adequate cohesion between the ground work and superimposed varnish When aged a sharp blow causes the varnish to *fracture* and *leave a flaked* surface

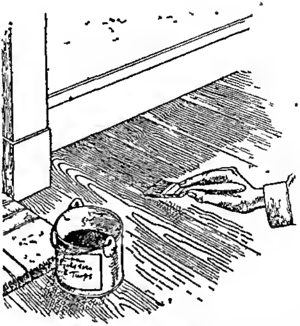


Fig 8 Laying off the surface with gold-size and turpentine to counteract the natural absorbent quality of timber

Stopping is undertaken after the gold size film is dry and hard Materials tools and procedure are as indicated for oil staining Twenty four hours are allowed for the stopping to harden, after which the surface is cut down with damp fine grained waterproof abrasive paper It is then sponged and leathered off

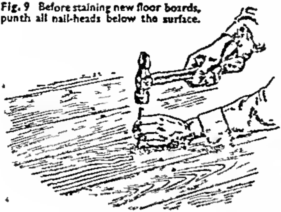
The surface may then need a second coating of the japanner s gold size and turpentine, or the absorbent nature of the timber may be sufficiently corrected for the application of the final finish in which case this application is carried out as directed in the chapter on varnishing

Staining is a treatment widely employed for wood floors It is an hygienically sound practice, in that it is easily kept clean, also *it affords* considerable protection against the abrasive action of traffic across its surface To obtain a first class finish, a good deal more attention than is usual should be given to the preparation of the surface

New floors which are to be stained should be blind nailed in the grooves of the boards when being laid If this practice has not been observed all the nail heads must be punched below the surface (Fig 9) The floor is then flogged with a plane to obtain a level surface and all the dust and shavings removed (Fig 10)

The stain may be applied in either an oil or a water medium

Fig. 9 Before staining new floor boards, punch all nail-heads below the surface.



the former being the more satisfactory All that has been previously said regarding the various types of material which may be used, and their method of preparation, applies equally to the staining of floors

Preventing Dark Edges

The stain is applied with large soft-haired brushes to the surface of three or four boards at a time (Fig 11), the staining of these is carried the whole length of the group before the adjacent group is commenced, to prevent dark edges developing where the patches join If the work has been executed in a water stain the floor is now sized, the term "sized" here means coated with japanner's gold size which has been diluted with turpentine or white spirit

The drying of the oil stain or the japanner's gold size is followed by stopping, this means filling all nail holes, bad joints, and shakes with a stiff paste made by kneading together white lead ground in linseed oil whiting, and the necessary dry pigment required to match the colour of the stained timber, and beating with a mallet The stiff stopping is pressed well into the crevices with chisel or putty knife and all excess removed from the surface At least forty-eight hours must be allowed before the coating of floor varnish is applied. The varnish used must be one of those specially made for use upon floors These are tough, reliable materials which will withstand the hard wear to which floors are subjected

Japan black, thinned with either turpentine or white spirit, is much used as a stain for floors, this proves satisfactory if a linseed oil varnish is superimposed, but experience has shown that it forms an unsuitable groundwork for the application of spar or tung oil varnishes and synthetic varnishes which dry mainly by polymerisation.

The colouring of panels with a light-coloured stain and the mouldings and stiles with one of darker

Fig 10. Using a plane to smooth the surface of floor boards Afterwards all dust and shavings must be removed

colour is the simplest form of decorative staining An example is to stain the flat of the panel to resemble satin wood and the remainder of the woodwork to look like walnut, mahogany or rosewood

Simple inlays can be suggested by painting appropriate designs with bleached lac dissolved in commercial alcohol upon the bare surface of the timber, the whole is then stained a darker tone The wiping of the surface with a clean cloth while the stain is still wet will remove it from the surface of the shellac leaving the pattern its former colour (Fig 12)

The imitative production of more elaborate intarsia work can be executed by applying the stains to sections of the bare timber in various colours either by masking with adhesive tape or by application through stencil plates

Effective large-scale work can be produced upon bare timber by painting the outline of a pattern device, or achievement with a paint made from drop black ground in turpentine and thinned to a working consistency with japanner s

Fig 12. Showing how stain can be applied so as to suggest simple inlays

gold size only When the outline is dry, stains of appropriate and vigorous colour are painted into the various sections These are allowed to dry and the whole is harmonised or mellowed by staining the entire surface ground and pattern with a thin stain (Fig 13)

Glazing

To the painter the term glazing means the application of a transparent film over a non-absorbent surface In this it differs from staining which recognises penetration of the surface as a valuable asset The ground upon which glazes are applied

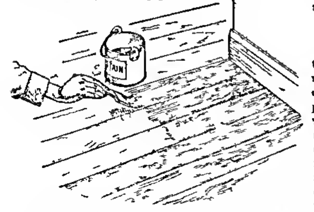


Fig 11 Stain should be applied with a large soft haired brush to the surfaces of three or four boards at a time

Fig 13. Effective large-scale work can be executed on bare timber by painting outline designs as illustrated here.

difficult and cohesion between the films will be impaired

The materials used are the same as for staining in oil and water media — prepared proprietary materials and the transparent pigments in paste form. Their preparation for use also follows the same routine They differ in the application and subsequent manipulation of the film while it is still wet

Glazes may be used simply to modify something which already exists, or as a means of patterning arranged or allowed for in the development of the scheme

must possess the same characteristics as that prepared for the reception of varnish, and is prepared in the same manner The final coat must dry hard and firm and with little or no gloss whatsoever

Preliminary Preparations

Should it be glossy, inclined to be greasy or tacky, or have been executed several days prior to glazing, the surface must be cut down with fine-grained waterproof abrasive paper and water as a preliminary preparation; otherwise even extension of the film may be

In the former case, a glaze may be applied over the whole of a finished scheme to modify harsh contrasts, to alter its general hue, to lower its tone or to give added depth and richness When any one of these effects is required, the transparent film, in either oil or water medium, is painted over the whole of the surface as evenly as possible with large, soft-haired brushes (Fig 14)

All evidence of brushwork is then eliminated by stippling, beating, or dabbing with the ends of the bristles of a soft-haired flat brush,

or by softening with a badger, a soft-haired brush, both types of brush being specially made for this purpose (Fig 15)

The glaze may be used upon a section or sections of a completed decorative scheme which is not quite satisfactory, by this means complete harmony may be produced

If such treatment is experimental it is best executed in a water medium so that it may be easily removed with warm water and the work returned to its original condition for further trials

The latter use, patterning is generally employed to give an added interest to large plain surfaces by manipulating the wet transparent film in such a manner that no regular repeat occurs A transparent film is laid over the whole surface as a thin wash in a colour not far removed in either hue or tone value from the ground upon which it is placed The wet film is then subjected to one of the following treatments

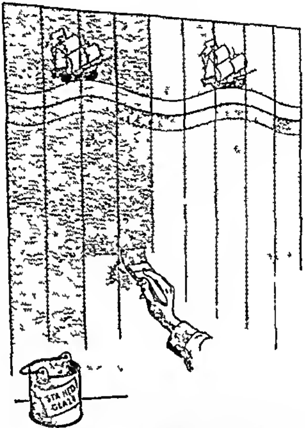


Fig 14 Glazes are applied to finished schemes to modify the originals and to give depth and richness These transparent films are painted over the whole surface as evenly as possible with large soft haired brushes

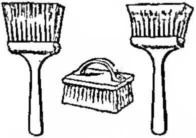


Fig 15 Soft hair brushes are used for eliminating evidence of brushwork

(1) Dabbing with the ends of a stiff haired stippler to give fine granulation
(2) Dabbing with the ends of rubber stipplers of various grades (Fig 16) to obtain larger granulation Care must be taken to avoid the shape of the stippler developing an irregular pattern
(3) Flogging the wet surface with

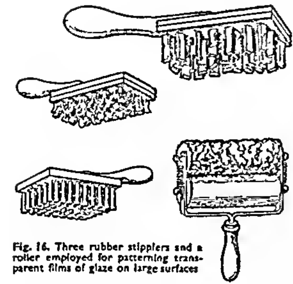


Fig. 16. Three rubber stipplers and a roller employed for patterning transparent films of glaze on large surfaces

the sides of the bristles of a long haired brush, called a flogger, or with the side of a flat dusting brush The beating of the surface must progress towards the end of the bristles, progression towards the stock will leave unsightly lines

(4) Dabbing with a damp sponge, kept clean by constantly rinsing in clean water if a water medium is being used, and in white spirit if an oil medium Care must be taken not to make a regular pattern the shape of the sponge

(5) Rag rolling Prepare a piece of old calico or chamois leather about 18 in square by cutting a hole in the centre about 4 in across From each corner make cuts 6 in long in the material and from the centre of each side make other cuts 4 in. long (Fig 17) Soak in either water or white spirit, according to the medium used Wring out and bunch up into a somewhat cylindrical shape Roll this over the wet glaze, which it picks off in an irregular manner

(6) More regular patterns can be developed upon glazes with prepared blocks or rollers, patterned with material which will take off the glaze. This opens up a wide field for individual experiment

The laying of a glaze is the preliminary stage of the process of graining The transparent film is manipulated by taking from and adding to it, in imitation of the characteristic markings and colour of the timber to be represented The representation of some timbers necessitates the laying of several films Glazing is also employed in the representation of marbles

Nearly allied to glazing is the

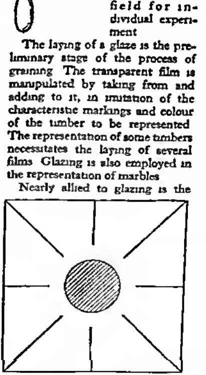


Fig 17. Pattern showing how to cut the cloth to be used for rag rolling

production of an evenly dull finish upon painted decoration which has dried with glossy patches Fuller's earth is tempered into a smooth paste with weak jellied size After considerable thinning with water, this is spread over the surface with large distemper brushes and stippled

This treatment was formerly given to decoration of an important or expensive character, the advantage being that when the work became obscured by deposits of dirt and dust, this film could be removed by washing with warm water and the decoration restored to its original condition

The imposition of a new film of the same character further extended the life of the work Such treatment affords protection without the discoloration incidental to the ageing of a film of flat varnish applied to obtain an even dull surface

Scumbling

Scumbling is a method of applying films of paint, made from transparent pigments, in such a manner that the density or obscuring power of the film is not uniform In its simplest form glazes in two tones of the same colour are prepared In some cases the two glazes vary in hue only, in others in both hue and tone Paints made from opaque pigments may be prepared and utilised in a similar manner

The prepared materials are painted upon the ground with large brushes in a somewhat indiscriminate or patchy manner, and softened one into the other by stippling Two stippler brushes are required one for the light and one for the darker colour Each is used as much as possible on its own colour, the bristles being kept clean by rubbing out occasionally upon clean rags The clouded effect obtained may be left as a finish or be rendered more interesting by the manipulations recommended for use upon evenly distributed glazes

Retarded Setting

When the surfaces are large, the rate of setting must be retarded to give time for carrying out the work upon the film before it sets For oil stain and paints a little refined linseed oil is incorporated If a water medium is used, a little glycerine is added to the ordinary water-soluble size, or the fixing may be done with thinned milk as a medium, this keeps the film open for a much longer period than other fixatives In small work, the softening is executed with a badger or softener brush Scumbling is extensively used in both graining and marbling

Ombré, shadow or shaded effects are produced in a similar manner to scumbling The arrangement of the tones or hues is, however, regular instead of indiscriminate The simplest form is the production of light centred panels A glaze is prepared, darker in tone than the paint work upon the panel This is evenly brushed over the whole surface and before it has set the centre portion is wiped off with a clean cloth, alternatively, a band of the colour may be applied round the outside of the area and while this is still wet the inner edges are merged into the centre by stippling

Ceilings are graded from dark surrounds to light centres This creates the optical illusion that the centre is higher than the sides, a valuable deception where ceilings are low For large surfaces these shaded effects are more easily

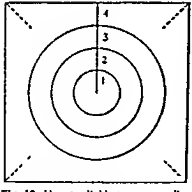


Fig 18. How to divide a square ce ling into circles drawn through three points

executed in opaque colours than glazes

The ceiling is brought forward up to and including the coat before the final one The paint is mixed in two pots or cans, one to be the lighter colour and the other the darker one They are strained separately In two other cans, or pots, quantities of the paints already made are intermixed to obtain even stops of tone from the lighter to the darker colour

Finding Ceiling Centres

The centre of the ceiling is determined by striking diagonal lines (Fig 18) If the ceiling is nearly square, the longer distance from the centre to the cornice is divided into four equal parts, and circles are drawn through the three points obtained with radii from the centre Should the ceiling be a pronounced oblong, both the longer and the shorter distances of the centre from the cornice must be divided into four equal parts Through the points obtained three concentric ellipses are drawn instead of the circles (Fig 19)

The centre space, circle, or ellipse is painted the lightest colour and stippled The adjacent ring shape is painted the next darker colour The bristles of the stippler are cleaned by rubbing with clean rags and the band breaking the sharp edge where it contacts the central colour is then stippled The next ring is painted in with the next darker colour, the stippler cleaned as before, and the edge stippled, breaking into the former ring The remainder of the ceiling is painted with the darkest colour, the stippler cleaned as before and the area stippled, breaking the edge into the adjoining ring

Treatment for Walls

A similar treatment can be given to walls In this case the wall is divided into a number of horizontal bands and the paint prepared in the required number of evenly graded tones For walls, one operative painter and a separate stippling brush for each horizontal band are required, so that the work can be carried round the room without a break.

In some cases the grading is brought about by change of colour, an extreme example being red at the bottom of the wall and bright yellow at the top The paint is prepared by first making the two which differ in the greatest degree, and

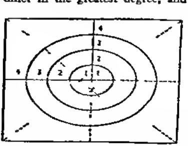


Fig 19 Layout for a shaded ceiling which is a pronounced oblong in shape.

then intermixing these to obtain three or four intermediate colours which are graded regularly in hue and tone

In this case also one operative and a separate stippling brush are required for each band

For the imitation of brocades upon walls in paint the above treatment forms the background, which is then stencilled upon in one contrasting colour

Coloured Oil Varnishes

For a somewhat limited period, oil varnishes which had been coloured with dyestuffs were employed for imparting colour to otherwise clear glass and to metallic surfaces in imitation of genuine lacquers They were never very satisfactory, as the oil content darkened with age and became more opaque

Coloured varnishes have been replaced by dyestuffs in clear cellulose lacquer, but still have a specialised use in theatrical work They are applied by dipping, brushing and with the air gun

Until about the middle of the nineteenth century painters obtained enamel finishes by getting up the work in a distemper medium and varnishing with a clear oil varnish During the early years of that century, a complete change had taken place in painting practice Formerly the craftsman had obtained his pigments dry in a powder or solid form Grinding them into the various media formed part of his craft Gradually power driven mechanical devices replaced the manual process, and firms were established to specialise in the conversion of the dry pigments to pastes by grinding them in refined linseed oil, thus relieving the painter of a great deal of laborious work

The bulk manufacture of varnish had probably preceded this by some fifty years Inventive genius no doubt prompted the experiment of grinding the pigments into a previously made varnish in order that the two might be applied at one and the same time

Some measure of success was attained but it was not until a method had been devised of thickening linseed oil by heating with little oxidation that a satisfactory medium was obtained It is into this viscous material that suitable pigments are ground When extended as a film the arrested process continues and solidification takes place

Enamels are always obtained ready for use and must be applied without dilution They are made so as to be satisfactory under specified conditions, for internal use, for external use, and as bath enamels, each should be restricted to the job for which it was intended (Fig 20) Some are made to flow out into a full gloss finish, others, a matt or dull finish

Enamel Containers

Enamels are normally supplied in hermetically sealed containers whose capacity varies from a quarter of a pint to one gallon (Fig 21) Most manufacturers indicate the area to be covered by one gallon The operative is thereby enabled to select and open the quantity required for immediate use

Enamels are not intended for long storage and are at their best as soon as they are received from the manufacturers Dry climatic conditions with the temperature

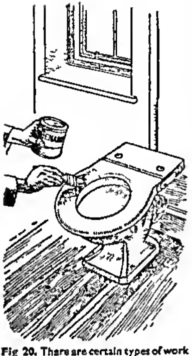


Fig 20. There are certain types of work for which some enamels are unsuitable

between 65 and 70 deg F are best suited for application

For surfaces which are to be left with an enamel finish the specification generally reads 'Prepare prime, paint three coats oil paint and finish with one coat of (proprietary brand) enamel"

For the application of an enamel the ground must be hard, level, evenly granulated and firmly attached The means of obtaining these conditions have already been described in the chapters dealing with painting and varnishing The coat upon which the enamel is to be placed must dry without gloss and nearly match the enamel in colour and tone

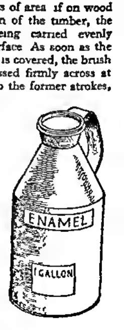
The prepared ground is lightly cut down with wet, fine-grained waterproof abrasive paper, sponged, and leathered off (Fig 22) The container is carefully opened, the enamel slowly stirred with a clean mixing knife or spatula and gently poured into a clean pot or can The formation of air bubbles within the material must be prevented

Enamel Brushes

The brushes used for its extension must have closely compacted bristles and be chisel pointed, perfectly clean, and free from dust The brush is worked into the material by carefully dipping into the enamel, withdrawing, and extending the picked up material upon a clean board or some inconspicuous part of the work

The enamel must be laid in a full coat with firm even strokes and not rubbed out at all barely Whenever possible the work is covered in complete units of area if on wood with the grain of the timber, the wet edge being carried evenly across the surface As soon as the complete unit is covered, the brush should be passed firmly across at right angles to the former strokes,

Fig 21 Enamel is supplied in sealed containers with the quantities plainly shown



crossed again, and re-crossed, finally laying off with firm strokes in the same direction as when the enamel was first laid

No attempt is made to leave the wet surface free from brush marks, the material itself will flow out into a level surface. Doors are coated in the following sequence of units each panel with its mouldings up to the sharp arris of the framing, then the muntins, top, intermediate, and bottom rails, and finally the stiles and opening edge Although the material is applied liberally, care must be taken that runs do not develop through excess of material, at the tops of the panels or upon the rails from the top sharp arris Undue accumulation must not be allowed to gather in the hollows of the mouldings

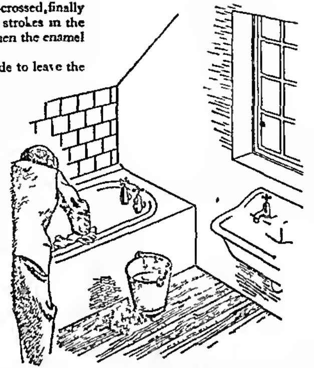


Fig 22. Before the actual enamelling is started, the ground has to be rubbed or sponged and leathered

Starting at Bottom

When enamelling a large wall commence by laying in the first patch at the bottom right hand corner The area must be fairly small in order that the next patch or patches may be satisfactorily worked in before the surface of the material sets This first patch develops two wet edges to be carried along The first operative moves to the left and extends the area by a lateral patch, while a second operative extends it by a vertical patch and then extends in a lateral direction one patch behind the first operative

The new wet edge is caught up by a third operative and he also extends the film vertically, perhaps completing the full height and then moving towards the left so as to follow the action of the two previous men By this means all wet edges are kept alive, as the work proceeds diagonally across the surface of the wall with no man obstructing the operations of the others For ceilings the scaffolding is generally so arranged that a number of men can carry along a wet patch of the whole width evenly and regularly

To re-enamel a bath successfully adequate attention must be given to the preparation of the old

surface The extent of this preparation depends upon the care or neglect with which it has been maintained If the old film is intact and in fair condition, the surface is washed with a solution of sugar soap and cut down with fairly coarse-grained waterproof abrasive paper to obtain a clean granulated condition for the reception of the new paint Should the old paint be

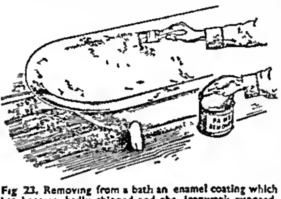


Fig 23. Removing from a bath an enamel coating which has become badly chipped and the ironwork exposed

chipped and the exposed iron rusted it may be necessary to remove the whole film with a liquid paint remover and to wash with white spirit (Fig 23) The rusted portions are burnished clean with stiff wire brushes and steel wool until all traces of rust have been removed the lubricant being white spirit. The surface is then wiped clean and dry with rags

Drying Hard

To obtain the best results, the undercoatings must dry hard but still retain some measure of elas ticity They are therefore made from paste white lead ground in linseed oil, broken up in japanner's gold-size, and reduced to a working consistency by the addition of genuine turpentine or white spirit The material is strained through butter muslin to obtain as thorough an admixture as possible

Filling In

Two or three coats of this material may be required to obtain substance and opacity, cutting down with fine-grained waterproof abrasive paper between each application Any filling which may be necessary is done between the first and second coatings, with hard stopping made from the same materials as the paint and stiffened with whiting

The paint upon which the enamel is to be laid must be similar in colour and tone A small container of bath enamel, which has not previously been unsealed, is opened, and the contents poured into a clean pot or can A clean, fairly stiff-bristled brush is carefully worked into the material The enamel is applied evenly and regularly in a good full coat At least a week must be allowed for it to set, and then the bath can be filled with cold water, which is allowed to stand for two hours, after which the water is run out and the enamel leathered off

The client should be warned that for the first few months cold water must be run into the bath before the hot-water tap is turned on *Should this not be done*, it may be found that all the good work that has been put in will be jeopardised, if not entirely wasted

CHAPTER VII

GILDING AND BRONZING

PREPARATION OF GOLD LEAF TYPES OF GOLD LEAF AND THEIR USES OTHER METALS IN LEAF FORM METALS IN POWDER FORM FIXATIVES GILDER S TOOLS AND EQUIPMENT LAYING LEAF METALS APPLYING THE SIZE LAYING THE GOLD ALTERNATIVE METHODS PROTECTION OF GOLD LEAF LAYING OTHER METALS BRONZE POWDERS LACQUERS MEDIUMS FOR BRONZE POWDERS SURFACES FOR GILDING AND BRONZING DECORATIVE USE OF GOLD

GOLD of 23 to 24 carat is used in the preparation of gold leaf A bar of gold is rolled into a ribbon, cut up into lengths, and beaten by hammers, varying 12 to 8 lb, until it is possible to cover an area of 250 sq ft with 1 oz of gold, or alternatively, from the same weight of gold, 2 500 leaves of 3¼ in may be cut

Gold Leaf

Best English gold leaf, which is used for gilding operations where permanency and brilliance are desired is not beaten so thinly and 2 000 leaves to the ounce is the maximum

Gold leaf can be obtained in a range of colours from deep red to pale yellow by the incorporation of other metals with the gold As these other metals such as silver and copper, easily oxidise and tarnish there is a risk of tarnishing corresponding to the amount of these metals introduced

Foreign gold is less dependable than English both in colour and thickness

The leaf of gold is 3¼ in sq and books can be purchased containing 25 of these leaves

The books slightly larger in area than the gold, are made of thin paper dusted with a fine red powder to prevent sticking The leaves of gold are inserted between each pair of pages in the book

In transferred leaf, the gold is lightly but firmly attached to thin waxed tissue paper The tissue is the same width as the book, but 1 in longer so that it may be held in the fingers without the gold being touched

Emergency transferring of the gold may be done by the gilder Thin white tissue paper is cut to the required size and the rough side is rubbed with a tablet of white wax Each waxed side is placed against a leaf of gold in the book When the book is filled firm but not heavy pressure will attach the gold to the tissue which can then be used to lift the leaf from the book as required

Ribbon gold also transferred is supplied in rolls of various widths It is made to facilitate the gilding of fine lines and small members of mouldings It is usually operated on a gilder s wheel

Silver Leaf

Silver leaf 4½ in sq, 50 leaves to the book It easily tarnishes, even in the book and when used must be protected by a lacquer,

which causes some loss of metallic lustre It is three times the thickness of gold leaf

Aluminium leaf, 5½ in sq, 25 leaves to the book It is duller in appearance and, although it does oxidise, the oxidisation is white and not so easily detected

White metal leaf, 5½ in sq, 25 leaves to the book It is not readily tarnished and has largely displaced the silver and aluminium leaf

Platinum leaf is very expensive and scarce, and is used only for special purposes

Leaf Bronzes

Dutch metal, 4½ by 3½ in In bundles of 2 500 leaves Alloy of copper and zinc.

Abyssinian gold, 6 by 3 in, 25 leaves to the book Alloy of copper and tin

Ducat gold 4½ by 3½ in, 25 leaves to the book Alloy of aluminium and copper

Copper leaf 3½ in sq, 25 leaves to the book

All these bronzes are easily tarnished and must be protected by lacquer when used They are thick and brittle in quality, easily handled, and may be cut to required sizes with scissors

All the bronzes, aluminium silver and white metal can be reduced to powder of varying degrees of fineness Although the term powder is used, the reduction by grinding is to a mass of very fine flakes, rather than to the texture usually associated with powder It is important to remember this when mixing the bronze with a medium

The range of colour procurable from these powders can be greatly extended by subjecting them to an oxidising process to produce varieties of red, yellow, and violet hues, and, by the addition of acetic acid, to produce blue and green hues

The metals are applied to a surface which is slightly adhesive or tacky The powders may also be incorporated in a medium.

Fixatives Used

The composition of oil gold size is oxidised raw linseed oil a drier such as litharge or sugar of lead, and a coloured pigment such as ochre or lemon chrome

This method of preparation is an old one, but gives fine results Place a quantity of raw linseed oil in an open mouthed glass jar Over the mouth of the jar fasten a piece of thin muslin to keep out dust without stopping the supply of air necessary to oxidise the oil

Finally, clip a piece of glass half an inch above the mouth to keep out rain Place the jar in a sunny place in the open air In a few weeks a skin will form on the oil, this should be removed, the oil well stirred and the jar replaced

Repeat this periodically for about six months To the oil which has now become thick and viscous, is added a little sugar of lead and ochre or lemon chrome The pigment should be finely ground in some of the oil before being added to the mixture itself

Prepared oil gold size may be purchased from paint manufacturers

Whether it is of the home-made or ready made variety, the size usually requires thinning Boiled linseed oil or a good varnish, such as carriage may be used At all times, oil gold-size shows a tendency to flow out and form 'fat'

edges. Varnish used as a thinner checks this tendency and can be more safely recommended On no account must turpentine be used

This size may be gilded upon after twenty-four hours, but should remain tacky to receive gold for several days after applying The longer size remains exposed, within these limits, without losing tack, the better will be the burnish and lustre of the gold applied over it

Japanner's gold-size, in composition, is a quick-drying oil varnish To it is added, by the gilder, a proportion of one of the coloured pigments mentioned, after it has been finely ground in the size

Drying time may be from twenty minutes to an hour, according to composition and conditions. A proportion of carriage varnish will extend the time of drying

Oil gold-size will give a smooth, brilliant, and lasting sheen, not obtainable by Japan size It cannot be used to any extent on exterior work, except when the work can be taken under cover, as the changes in the atmosphere, and the risk of dust over a period of twenty-four hours, would be too great for good results Nor can it be used as a size for other metals, as the oil would cause discoloration by oxidation

Japan gold-size is useful where the gilding must be done quickly, but the shorter drying time is against the best results Good lustre can be obtained by correctly judging the degree of tackiness.

Gilder's Kit

The gilder's kit includes the cushion, a small board, 6½ by 9 in , or less, padded with cotton wool and covered with chamois leather A draught screen of parchment is fitted to the rear portion Underneath is a thumb grip, and a holder for the knife

The knife has a flexible blade of equal width throughout its length of about eight inches The cutting edge is smooth but not sharp

Gilding Tips

Camel hair or badger hair is placed in a row, and fastened between cardboard to make a thin brush by which gold is lifted from the cushion Tips are of various lengths from ½ in , to take up narrow strips of gold from the cushion, to 2½ in , for broader strips and full leaves

Dabbers of camel hair, to press the gold-leaf on to the size

Cotton wool, also for pressing, and the final burnishing

Sash tools and fitches, for removing loose gold

The skew bag is made of paper, and is similar in size and shape to a triangular paper hat Into it is brushed the surplus gold from the gilded surface This surplus, called skew, is valuable salvage and it is collected, together with fragments left on the tissue in transfer gilding, to be returned to the gold beaters for recovery Even gold which may have been burnt off with the paint can be recovered

The pounce bag, of soft rag filled with French chalk or fine sifted whiting This is used for dusting over the surface before sizing is done to prevent gold sticking in places where it is not intended

Sponges and chamois leathers are for cleaning the ground before gilding, or washing down the finished work

All this equipment must be kept free from damp and grease, otherwise trouble will be experienced with the gold, which will stick to

any such surface The knife, if it becomes damp, will be pitted with rust, so preventing clean cutting and lifting of the metal

The sizing equipment comprises sable and hog-hair pencils, fitches, and sash tools, or 1-in flat brushes, a number of small dippers and small varnish kettles, palette board, and mahl (rest) stick.

Preparing Surfaces

Surfaces to be gilded are often prepared ready for the gilder. They may be flat (without gloss), glossy, smooth, textured, or enriched Any such surface should be impervious, so that the gold size will not sink in The paint or varnish should be hard and free from noticeable tackiness

It is rarely safe to gild without some precautions being taken to prevent gold sticking to the ground, except, of course, where a whole area is to be gilded

On a flat ground, French chalk or fine sifted whiting may be dusted on from the pounce bag The same may be used on a glossy ground, but it is apt to cause creeping and clogging of the size

Glair made from the white of one egg and beaten up in a pint of water is more satisfactory It is applied over the surface with a camel-hair brush and allowed to dry before the sizing is attempted When the gilding is complete wash down the surface with water and, using the chamois leather, remove the glair which, if left on too long, would affect the gloss of the ground

Gold will reveal, not hide, blemishes, and much depends on the selection of the right type and size of brush The largest practicable should be used, one too small necessitates making a number of narrow strokes which may cause piling of the size, whereas one or two strokes with a larger brush lays the size evenly and quickly.

As before stated, oil gold-size shows a strong tendency to flow out This is also true, although to a lesser degree, of Japan size If the size is not carefully brushed out or is too thick it is liable to gather at the edges of the work, and even cause them to lose shape and the sharp clean-cut appearance which good work should have.

For this reason Japan gold size mixed with a little carriage varnish, to slow it down, is preferable to the oil size on narrow lines, fine ornament, or small lettering Whether the surface to be gilded is large in area, or of decorative forms of small area, it is of the utmost importance that these points be carefully observed Time spent in adjusting the size to the requirements of the surface, temperature, and flow will be repaid

A well-balanced, well-laid size should present an even surface, and dry with an even tack, free from stickiness over the whole area to be gilded With oil gold-size the extended life of the tacky period obviates the tendency to gild at the wrong moment The size may be laid one day and gilded the next, or on one of several succeeding days, without either undue haste or great danger of leaving it too long

Quick Drying

With Japan size it is difficult to judge the right moment when gilding may be done, for towards the end of its drying cycle the rate increases, the gilder may find the tackiness gone, and the size too hard to gild upon To avoid this

danger there is a tendency to gild too early, resulting in crinkling and a lack-lustre finish on the gold

Preparations

1 Place the gilder's cushion on a table or other convenient spot Take the book of gold in the left hand, open the first page with the right at the same time allowing the leaf of gold to fall on to the screened portion of the cushion A short puff of breath is usually all that is necessary if the leaf does not fall of its own weight If, as sometimes happens, it still does not leave the book, it indicates dampness in the pages After slight warming of the book this difficulty should be overcome

Allow a number of leaves to fall on to the cushion in this way An expert would commence with a book of 25 leaves on the cushion, but the *less skilled operator* should master the technique first

It is not easy to keep these flimsy leaves under control yet it should be done, for it is not economical to have only one leaf on hand

When the cushion has been loaded, place the thumb of the left hand in the strap beneath

2 With the knife in the right hand insert the blade under the uppermost leaf and gently lift it to *front portion of cushion (Fig 1)*

Fig 1 Lifting the leaf from the heap to the front of the cushion

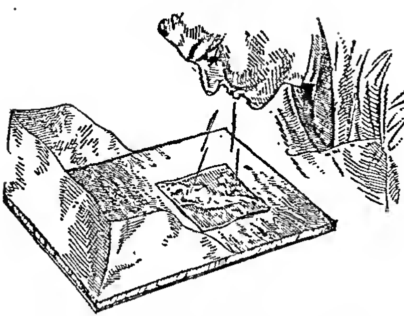
It should be pointed out that the leaves fall from the book in a loose but crumpled heap, and although each can be easily lifted, it is not possible to do more than lift and lay down the crumpled leaf with the knife, no attempt should be made to flatten or straighten it out This is done by directing a firm, short, puff of breath into the centre of the leaf *(Fig 2) If this operation* has not been well performed, the leaf may have left the cushion and floated away into space

Handle Carefully

Do not make a dash to recover it, remember the other leaves are liable to leave their shelter at the slightest provocation Allow the escaped leaf to settle and then gently *return it to the cushion with* the knife resisting the inclination to lift it with the fingers Gold leaf is too fragile to handle and the natural oil in the skin would cause it to adhere to the fingers

If the operation has been successful and the leaf is quite flat on the cushion, take the knife and lay the edge along the line of the cut to be made, the blade being perpendicular with the cushion

Draw the knife across the leaf with a slight but firm pressure (Fig 3) If the cut is not clean and shows ragged edges either the pressure has been too great or the knife edge is at fault (it may be greasy damp or has become pitted by rust caused by damp) (Fig 4) When estimating the area of the piece of gold to be laid, allowance should



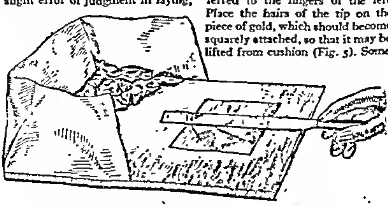
STRAIGHTENING OUT THE LEAF

Fig. 2. Directing a firm, short puff of breath into the centre of the leaf.

be made for a slight overlap on the space to be covered.

There must be some wastage, but it is better to allow sufficient for a slight error of judgment in laying, than to under-estimate and have t[illegible] cover the fault up afterwards.

3. Take up the tip in the righ[illegible] hand, the knife having been transferred to the fingers of the left. Place the hairs of the tip on the piece of gold, which should become squarely attached, so that it may be lifted from cushion (Fig. 5). Some



"CUTTING" WITH THE GILDER'S KNIFE

Fig. 3. A knife is used for manipulating the leaf. The edge should be smooth and quite blunt, and does not really cut the leaf but rather wears it through.

without haste or unnecessary movement In operations (2) and (3) the knife and tip are constantly being used alternately, when one is engaged in the right hand the other should be held in reserve by the fingers of the left Although a knife hold is fixed underneath the cushion it is seldom used, the suggested method becomes in time automatic, saving time and effort

Various Methods

1 On large areas better results and economy in leaf are obtained if whole leaves are laid In fact in all gilding, cutting of the leaf should not be resorted to unless the area is small and demands it

(a) The leaf can be used from the cushion as before, but using a long and sometimes reinforced tip to lift it firmly The reinforced tip is made by gluing two tips together one being in advance of the other so that the length of hair is extended as shown in Fig 7, or

(b) The leaf can be taken direct from the book by the tip, or

(c) Take the book in the left hand partially open a page and allow the leaf to become attached by its forward edge (Fig 8) Gradually open the page, draw the book gently away, allowing the leaf to fall on the surface, to be pressed down with the mop or cotton wool pad This method is quick and specially useful when gilding large surfaces out of doors in windy weather Some practice is needed to avoid waste but not more than in other slower operations

2 Relief enrichments and carvings Full leaves and large pieces are laid first on the protruding

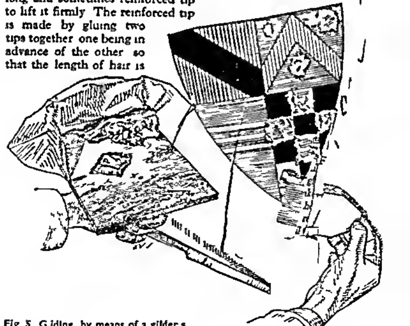
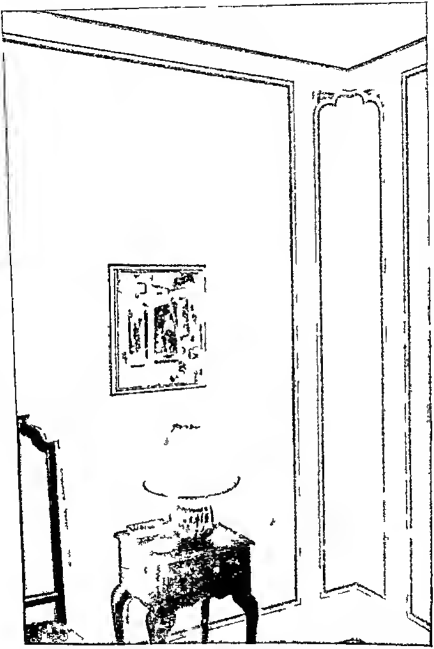


Fig 5 Gilding by means of a gilder s tip from the cushion to the required position In this case an heraldic design

PLATE I



WALL PAPER PANELLED WITH STILING

Showing the use of a double edged stile border with a pa r of cut out corners on a John Line & Sons wall paper Note placing of the upright st les and the concentration of interest in the corners made by the narrow panels and the decorative motifs Half width stil ng only has been used as a surround on the ceil ng

USING AN OVERGRAINER ON FEATHERED MAHOGANY

On a panel grained in feathered mahogany the overgrainer is being used to put in the heartgrain which overlays the feather formation. The bristles are separated by dragging them through the coarse comb to give clean lines of colour

portions of the enrichments Cover as much of the area as possible and press the gold down with a gilder's mop, taking care to avoid the tacky size in the crevices Faulting is then done with small pieces cut to shape, until the whole area is covered (Fig 9)

The gilder's mop plays a big part in these operations, for a cotton wool pad cannot be used to press the gold into deep carving or modelling

Never use bronze powder for faulting up the difficult places It may look well at the beginning, but within a short time it would blacken and bring ruin to the whole expensive surface

In positions well above the eye, such as enriched cornices, it is not always necessary to gild solid The surface is finished with a paint approximating to the colour of the leaf Gold is laid on only where there is a possibility of its reflecting surface being seen

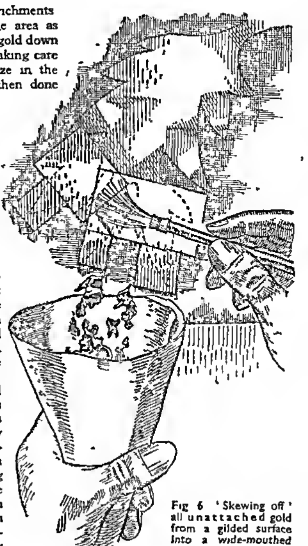


Fig 6 'Skewing off' all unattached gold from a gilded surface into a *wide-mouthed* paper bag

Using transferred leaf is the easiest way of laying gold-leaf where the surface and situation make its use possible

Advantage should be taken of this only when it is not possible to use the tip and cushion, for the results are not so good

Narrow lines or etching, small lettering, gilding on exterior signs, and ornamental work on small areas, are examples of work which may be carried out to advantage by this method On no account must it be used to supplement the tip and cushion method on any job The portions laid by the tip would be distinct in colour and lustre from the transferred leaf, owing largely to the greater pressure

which is, perhaps unconsciously applied when laying the latter

Preparation and sizing of the work is the same as that for tip cushion gilding

The transferred leaf is taken from the book by the extended piece of tissue It is held with the first and second fingers under neath, that is the side to which the

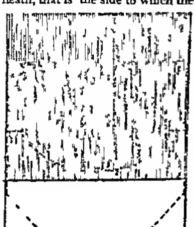


Fig 7 This double gilder s tip is made by securing two single tips together one in advance of the other the card of the foremost tip being partially cut away to permit of greater flexibility

gold is attached and the thumb on top (Fig 10) Pressure by the thumb into the V between the two fingers holds the tissue rigid.

When gilding the coloured size can be seen through the tissue and it is quite easy to control the placing of the leaf to good advan tage and without the amount of overlap and wastage necessary in the former method A slight pressure of the thumb on the back of the tissue will attach the gold to the sized portions Gold is taken only from the tissue which has touched the gold size and the leaf can be used up until only frag ments remain The used tissues are sent along with the skew' for recovery of the gold still adhering

Faulting being done as the gild ing proceeds all that remains is the final burnishing with cotton wool It is better to leave this as long as possible, if time permits than to run the risk of injury before the size becomes hard

On rounded surfaces use a cotton wool pad instead of the thumb to press the gold on the tissue to the size Being soft the pad adjusts itself to the contour and the work proceeds quicker

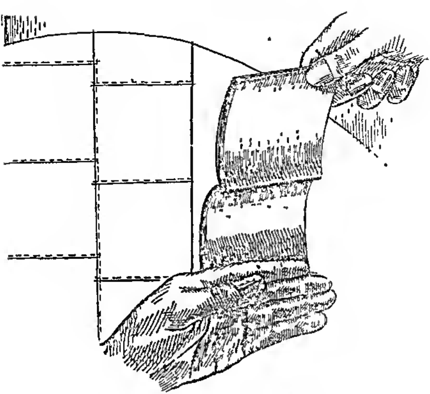
Some people prefer to use cotton wool on all occasions for with it the pressure while being firm is not so severe as with the thumb and there is not the same risk of injury to the brilliancy of the gold On the other hand, there is a danger of the cotton wool going beyond the edge of the tissue to leave shreds of wool on the tacky size (Fig 11)

In gilding enriched surfaces it is not always possible to reach the deep portions of the work in the first application In this case the work if anywhere near to the eye must be double gilded

Protecting Gold Leaf

In theory gold should not be covered in any way It will outlast the adjacent paint surface and any covering up by varnish etc., seriously affects its lustre

In practice interior gilding may receive a thin coat of parchment size This gives an even sheen to the gold which compensates for the



GILDING FROM THE BOOK

Fig 8 Opening the pages allowing the leaf to become attached by its forward edge

slight dimming The size also protects the gold from accumulations of dirt and dust, when the work is washed down the dirt, dust, and size come away, leaving the gold unimpaired

To make parchment size, parchment cuttings (obtainable from gold leaf beaters) are stewed slowly in water While still hot, pass the liquor through a strainer—two thicknesses of an artificial silk stocking fastened over the top of an earthenware jar will answer the purpose—and allow it to cool to a thin jelly It can be used in this form and is laid with a broad camel hair brush or soft hog's-hair brushes

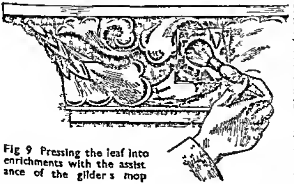


Fig 9 Pressing the leaf into enrichments with the assistance of the gilder's mop

In some operations it is impossible to avoid varnishing over the gold This occurs in fine work, such as

heraldic painting, in which the gold is interwoven amongst the colours In cases like this, size the work before varnishing

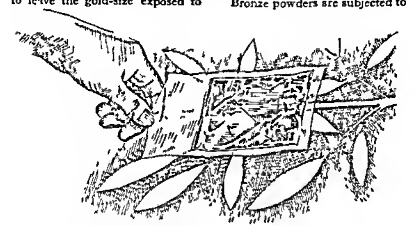
Other Metals

Platinum leaf can be laid upon the same sizes and in the same way as gold-leaf

As a fixative to silver, aluminium, and bronze, use japanned gold size tinted with appropriate colour If the metal is thick, it is an advantage to leave the gold-size exposed to the metal must be laid somewhat earlier, but always remember that when the size is overlaid with a metal it is sealed, and any further natural drying is prevented, and there will be expansion and contraction if the laying has been done too early

Silver and the bronzes must be lacquered or covered with parchment size without loss of time after laying, to prevent discoloration by oxidation

Bronze powders are subjected to



TRANSFERRING THE LEAF

Fig 10 Holding the leaf between the thumb and fingers by the extended tissue.

become more viscous (thickened) before use

When the leaf is not too thick it may be laid by the same methods as given for gold, that is either with tip and cushion, transferred, or direct from the book The thicker bronzes may be cut to size and shape with scissors and will stand handling freely

If the fingers are moist it is advisable to dust them with french chalk to prevent tarnishing

These metals will not adhere to size of the same fine degree of tackiness as used for gold, therefore the same restrictions as the leaf bronzes They must not be laid upon an oil size, mixed with any medium containing linseed oil or covered with an oil varnish without an insulating coat between

The powders may be dusted upon a tacky Japan size or, for very quick work, on spirit varnish The usual precautions regarding prevention of sticking must be observed prior to laying of the size

The powder may be taken up and dusted upon the surface with either a hare's foot a camel hair mop, close cloths, chamois leather,

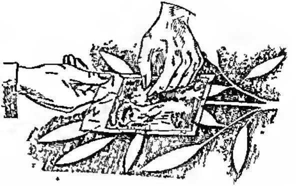


Fig 11. Laying leaf by transfer, using cotton wool as a pad to give the slight pressure necessary

or cotton wool

After the sized surface is covered with the bronze, burnish with a pad of cotton wool This method gives a more metallic finish than is obtained with liquid bronzes and lends itself well to decorative treatments The disadvantage is that the metal itself is exposed and, to prevent tarnishing, must be covered with some protective agent which lowers the degree of lustre

Texture of bronzes use coarse material for high gloss, use fine material for protection of surface

Extra coarse flakes of metal called "flitters" and "speckles" can be used for decorative effects

Liquid bronzes are largely used for industrial finishes as priming coats for wood and metal, in rust-preventative paints, in anti fouling compositions, in heat-resisting and fireproof paints, etc They can also be used for decorative purposes especially when applied by the spray gun These liquid bronzes settle fairly rapidly in the medium and require to be constantly stirred If this is not done, patchy and sheary results will be obtained

Purpose of Lacquer

Lacquers may serve two purposes (1) Prevention of tarnishing, (2) changing the colour of the metal This is done by adding dyes to the lacquer Gold should be lacquered if it is to be shaded, as in antique finishes The leaf bronzes and powders must always be lacquered The liquid bronzes are partially protected by the medium in which they are mixed and are often left without further protection, although some tarnishing of the surface particles occurs

Composition

Clear lacquer $1\frac{1}{4}$ oz of white shellac dissolved in 1 pt of spirits of wine

Coloured lacquer
- Warm colour Use garnet or orange shellac
- Red Dragon's blood, natural dye (resin from an eastern Asiatic tree)
- Crimson Brazil wood, natural dye
- Brown Aloes, natural dye
- Yellow and gold Saffron and turmeric, natural dye
- Green Brilliant green coal-tar dye
- Bronze green Brilliant green and chrysoidised coal tar dye
- Blue Sandarac (resin) and alkali blue, coal tar dye
- Violet Sandarac (resin) and methyl violet, coal-tar dye

Ready prepared lacquers may be purchased from varnish manufacturers

Lacquering is usually done cold by the decorator Lacquers are susceptible to cold and humidity and,

during application in the presence of either, may bloom and take on a milky white appearance The room where the work is to be done should be warm and of a dry atmosphere

The lacquer should be spread with a camel-hair brush The brush should be as large as is consistent with the work being done, for the lacquer dries very quickly, and will not stand working in the same way as paint or varnish. No retouching is possible and the edge must be kept "alive" until the work is finished

If the object to be lacquered is movable, it can be taken near a fire, but remember that the material in use is inflammable and care must be taken to avoid risk of fire

Unsuitable Mediums

Any mediums for bronze powders should be free from acid, linseed or other vegetable oils Many of the resins contain organic acid, and are, therefore, unsuitable White spirit is preferable to turpentine for diluting the mediums

Various mediums are

(1) Japanner's gold-size diluted with white spirit
(2) Shellac dissolved in spirits of wine or any good spirit varnish
(3) Shellac with amyl acetate alcohol, and benzine
(4) Varnishes of low oil content containing ester resin (rosin and glycerine)
(5) Cumarone resin, white spirit, blown castor oil
(6) Cellulose lacquers

Liquid bronzes can be purchased ready made In many cases the mediums and powder are supplied in separate containers for mixing when required Aluminium is now procurable in paste form ready for incorporation in the medium. The value of a metallic paint as a protective covering *depends upon its* leafing qualities, the metal flakes should settle down upon the surface, forming a complete metal covering If the powder and medium have been mixed together for some time, this leafing quality is disturbed and also the finish loses its lustre and is leaden in appearance

When cellulose lacquers are being used, it should be remembered that the solvents used in them will resoften an oil paint film, therefore, the ground should be hard and free from oil or, if possible, the lacquer may be applied over water paint

Surfaces fall into two broad groups (1) flat, rounded, or undulating areas with the light falling upon surfaces and giving to them an almost mirror-like sheen, (2) the enriched or textured surface on which the sheen is broken up into segments which reflect the light *in spots or patterns*

The first group demands good preparation and freedom from brushmarks and other blemishes which would be intensified by the reflecting surface.

In the second group the object is almost opposite, except that any enrichment or texture must be equally well prepared

Using Gold

Gold is a precious metal, and it should be used only in a precious way The colours associated with *it must be rich, either in their* strength of hue or in their purity of tone Gold will accept nothing but good design in architectural lines

and ornament It likes richness, it likes simplicity, but will not accept bad design and colour in room, furniture, or fitments

The simple lines of a modern room will carry gold in the mass on a well-prepared flush door or as a background to a decorative panel

The other metals and bronzes may be used in somewhat similar ways if the decorator will always keep in mind the lesser value of the metal be is using

Repairing Cracks

If it is intended to gild or bronze solid, the plain plaster surface must be free from cracks and uneven plastering Every blemish will show

Make the cracks good, apply several coats of water paint and rub down with fine glasspaper, or line the walls with paper after filling in the cracks

After either method, finish the surface in a flat paint

If a texture is acceptable, the problem becomes easier After the necessary preparatory work has been done, put on one of the pro prietary plaster paints or a half and half mixture of water paint and fine plaster of Paris The texturing may be done in a simple stipple with a hog hair stippler, or other tools may be used for variety and higher relief

A textured wall may be finished in colour and have only the high lights bronzed

Liquid bronze is mixed fairly stiff on a piece of glass or other flat surface A soft rubber roller (about six inches wide) is charged from this by rolling it in the bronze This is then rolled over the walls so that only the high parts of the texture will be receiving the metal

The wall may be splattered with gilt spots A stiff brush is charged with the bronze and held close to the wall

When the ends of the bristles are pulled and allowed to spring back again they discharge spots of bronze on to the wall The spray gun has largely superseded this method, the work being done quicker and with more regularity in spacing and size of spots

When applying metal in leaf form to a relatively large area, the joints of the leaves can very often be seen This may be accepted and even developed If the books of metal are left exposed for a few days the edges will become oxidised When the full leaves have been laid over the surfaces the edges will form a pattern, relieving the surface effect Using bronze leaf of a slightly different colour occasionally will add further interest

Lining in Bronze

Gold or bronze lines are an effective form of decoration If bronze is used it is better to run the lines in size and dust the powder on The lines are clearer and the work less messy than with liquid bronze

A surface may be laid in with a white metal and finished in various colours by the application of coloured lacquers

Glazing with fine oil colours may be done over a lacquered surface, in fact, when the surface is protected with either parchment size or lacquer, decoration in paint may be done without risk of tarnishing

Finely ground pigments may be mixed with the bronze to give a metallic sheen to coloured surfaces, or bronze powders may be added to the coloured synthetic enamels

CHAPTER VIII

SPECIAL PROCESSES

GRAINING AND MARBLING LAYER FORMATIONS IN OAK DESIGN AND COLOUR GROUNDS AND MEDIA WATER GRAINING COLOUR GRAINER S OUTFIT APPLYING GRAINING COLOUR ON GLAZE OAK GRAINING OTHER WOODS GROUND AND GRAINING COLOURS MARBLING MARBLING TOOLS AND EQUIPMENT INDIVIDUAL METHODS STIPPLING STENCILLING STENCIL DESIGN TRACING AND CUTTING A STENCIL LINING PLASTIC PAINTS TEXTURING FINISHES GLAZING OIL BOUND PLASTICS SYNTHETIC RESIN FINISHES COMPOSITION

GRAINING and marbling are two crafts which have been subjected to much criticism The attempt to depict woods and marbles in a paint medium has been criticised as a deception and an offence against good taste

It is not the intention to discuss the ethics of these contentions except in so far as they affect the practice of graining and marbling

Imitative Crafts

Granted that these crafts are imitative can the above criticisms hold good in this era of synthetic marbles and thin wood veneer on cardboard? On the one hand say the critics there is in good examples *a high degree of* crafts manship and design on the other a mechanical use of the materials themselves to achieve a similar object The criticism might more reasonably have been directed against the sordid over-exuberance of the Victorian age as portrayed on the licensed houses of that time and the hack who followed turning out vast quantities of flowery shoddy work with a complete disregard to colour values and fitness Thomas Kershaw of Bolton and John Taylor of Birmingham grainers and marblers of international fame exhibited and were awarded medals at exhibitions in London and Paris from 1851 to the close of the century Both were granted the Freedom of the City of London

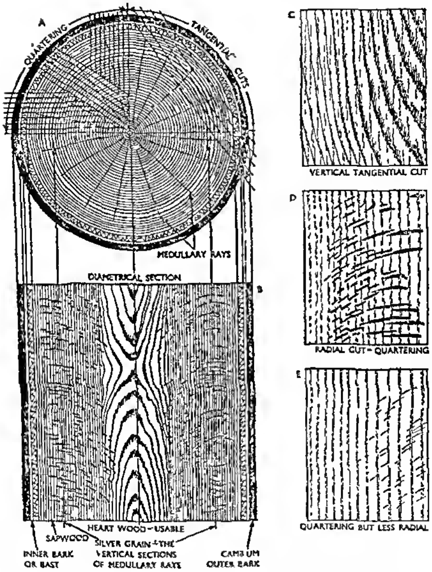
Unfortunately many people tried and failed to emulate their example They failed from a lack of faithful study of the first essentials of the materials and principles involved These may be designated as

1 Origin and structure of (*a*) woods (*b*) marbles
2 Design colour and fitness
3 Grounds and media

(1) *Wood* The oak tree is selected as the example illustrating growth and structure *It contains* clearly defined features some of which are not seen in other trees It is the wood most widely selected for graining and the most difficult to render An oak tree may be up to two hundred and fifty years old when fully matured and ready for conversion into timber

Scrutinising Oak

Examine the end of an oak log when the tree is cut down (Fig 1) The outer ring is the bark which resists changes of temperature and protects the cambium layer of



DIAGRAMMATIC SECTIONS OF OAK

Fig 1. Medullary rays which impart the silver grain are seen at (A) When a tree is quartered, the silver grain is shown in its greatest beauty, but a tangential cut is without silver grain This can be seen at (C) (D) and (E) The vertical section of the cut log seen at (B) shows the growth of the tree with central heartwood and, on either side of this, lies the straight grain caused by the annular rings Towards the outer edges is the wood which is unusable for constructional purposes

woody tissue from which a new ring of wood will be formed The bast, or inner bark, may be likened to the skin and the outer bark the wool of the sheep The sap rings have been added during the last fifty years and are so full of life and sap as to be useless for timber

How Wood Grows

Two layers of wood are formed each year, a quick growing and open one in the spring and a darker and narrower one in the autumn As each layer is added from the cambium to the sap ring, another is added to the more inert and usable heartwood The medullary rays, radiating outwards from the centre pith, give to the quartered oak its beautiful silver grain It will be noticed that the rings are not solid, but are a mass of tissue formed by the ends of the pore ducts These pore ducts in vertical section are not continuous lines, they are crossed by the silver grain, which also carries sap and broken by straight saw cuts into small segments interrupting their more sinuous or wavy lines

The conical or oval formations down the centre of the heartgrain are the vertical sections of the first few years of growth when the tree was still a sapling This formation is often called the sap, which is a very misleading term, suggesting as it does the still immature sap rings If the tree grew perfectly straight and the saw cut followed the same straight line the silver grain would be continuous and the cones of heartwood ascend without break to the tree top, but nature does not work like that.

Climate plays a big part Lines are straighter and more continuous when the growth has been quick and protected In climates of variable temperature, cold and wind bend the trees On the side facing north the annular rings are closer together than on the warmer side Every small twist and bend is registered in heartgrain, silvergrain and pore marks

Every branch which the tree throws out exerts its influence from the first year of its existence, and it may go right back to the core of the tree Every scar suffered by the tree, a broken branch, a deep incision or even a plague of insects eating the leaves in any particular year, will have an effect and give variety to the design of the cut plank (Fig 2).

In some trees the work of boring insects adds peculiar markings to the grain as, to give a specific example, in bird's-eye maple

Intelligent Interpretation

(2) *Design, Colour, and Fitness* It is only by a study of such facts as the above that the grainer can interpret his subject intelligently understand its basic principles, design his panels, achieve balance and unity, and avoid repetition. Lack of this knowledge leads to the copying and lifeless interpretation of a few stock designs such as may be seen in many a so-called grainer's work

If with all this data in mind the student examines pieces of quartered, or, as it is sometimes called wainscot oak, he will be assisted in understanding why the grain has taken this or that formation and can add limitless variety to his work He should never try to copy faithfully actual pieces of wood, but should analyse and design from them

It is a singular fact that pieces of

oak in which the design is really suitable for copying are not common and must be diligently sought

Colour plays an important part in the grainer's craft It is not sufficient to say that oak is yellow mahogany red and walnut brown in colour The primary yellow red or brown hue is often over emphasised A study of the subtle variations of the natural wood will give a wide scale of tones in which each wood may be used

The grainer must design and colour his work to be part of a balanced scheme If it be in a room the other features must be considered Restraint in pattern may be indicated or on the other hand some licence may be given In a room with one prevailing colour the graining can be made to harmonise with that colour without losing the natural characteristics of the wood

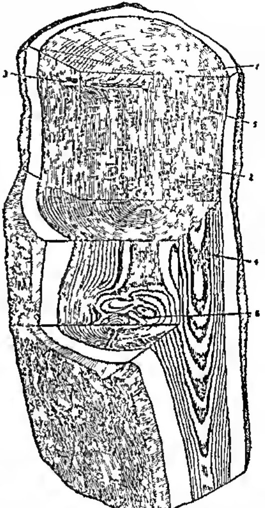


Fig 2. This section of a laburnum tree has been cut with faces at varying angles to illustrate changes in form and other characteristics (1) Centre of the tree is nearer the side which has faced north (2) Radial cuts following the medullary rays disclose the silver grain (3) Flecks of silver grain appear in the cut taken diametrically across the rays (4) Tangential cuts show heartgrain (5) Note the effect of boughs on the straight grain and silver grain in the radial cut (6) Swirls in the heartgrain caused by boughs

(3) *Grounds and Media* Graining may be done on bare woods which are not strongly marked such as white pine or whitewood

Graining Bare Woods

They are prepared with a clear sealer to stop absorption of the graining colour Distemper and water paint grounds are also suitable Only oil painted grounds will be dealt with in this chapter

Oil paint grounds should be hard and of egg shell gloss If too flat

the graining colour will work harshly; if too glossy, it will slide and lose form It must be level and free from brush marks and should be of a colour approximating to the lightest tone in the selected wood

Colour Selection

Be very careful in the selection of correct ground colour If in doubt, let it be greyer rather than over-bright Do not make it too light if the wood to be grained is dark, thick graining colour, used to correct a light ground, gives a muddy appearance to the work

Later in the chapter the composition of ground colours and glazes will be discussed, but only basic principles can be given, and the grainer must use his own judgment as to the proportion of each stainer used The same may be said of the excellent prepared glazes made by paint manufacturers Their range of glazes, or scumbles, must of necessity be limited The wise grainer will take some transparent glaze of the same make as the material he is using and some finely ground dry pigments or tubes of oil colour to make adjustments

Glazes, or graining colours are of two kinds, oil and water They are made from a medium and semi-transparent colours or pigments The object is to allow the colour of the ground to show through the glaze in varying degrees of tone consistent with the character, colour, and markings in the woods

Two Media

Graining may be done in either or both oil and water media

The oil colour medium is variously called thinners, medium, megilp, or gilp The latter terms are misleading when applied to the medium as a whole, megilp is an extender, usually containing beeswax, and the object of its use is to make the graining colour "stand up," or prevent its flowing It provides easy working, but its use is unnecessary if the graining colour is well brushed out

The medium is composed of raw linseed oil, liquid oil driers, and turpentine Usually the turpentine will be slightly in excess of the oil The proportion of driers will depend on the quantity of oil used, drying conditions and sometimes the colours used Vandyke brown and black retard drying

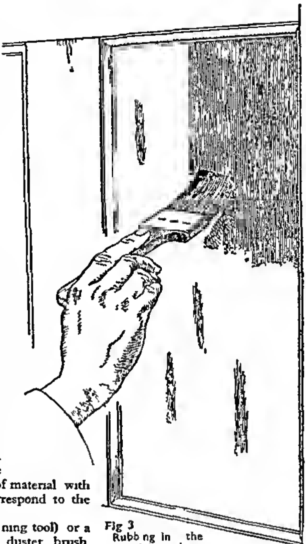
Pigments to Use

For colouring either dry pigments may be used, finely ground into a paste with some of the medium, or oil colours in tubes As the proportion of pigment in a glaze is small it is not uneconomical to use colours in this form They are finely ground save waste, and are convenient to use

Paste colours in oil may be used, bought by the pound or in larger quantities

To prepare the graining colour, pour some of the medium into a paint kettle and on a palette place a portion of each stainer to be used With a large fitch take the principal colour from the palette and work it into the media Use the other colours in proportion until the desired strength and colour of the graining colour are obtained

Water Graining Colour The medium may be either one third stale beer and two-thirds water, one third vinegar, a little sugar, and two-thirds water, or skimmed milk and water Excess of binders may cause cracking of the varnish



super imposed A few drops of glycerine may be added if the work dries too quickly

It is convenient to buy the colours ready ground in water but dry pigments may be ground into the medium when required Vandyke brown if not mixed with other colours does not require binding and can be mixed with water alone

The grainer s kit includes the following items Rubbing in brushes for oil a sash tool or 1 in brush for applying colours a 3 in flat or a pound brush for spreading the colour

Set of steel combs rubber and leather combs made from small p eces of material with notches cut to correspond to the width of the grain

Drag (brush gra ning tool) or a worn wire drawn duster brush Horn thumb piece for putt ng in the silver grain of oak (some grainers dispense with this and use the thumb nail)

Fig 3
Rubb ng in the oil graining colour

Clean Rag

Rag from well washed bed sheeting or from calico for covering the thumb-p ece

Badger hairsoftener 3½ in hog hair flogger

Hog hair mottlers of several sizes and thicknesses 2 to 4 in

Two in camel ha r mottler or cutter

Hog hair overgrainers in two sizes 2½ and 1½ in

Sable pencil overgrainer broad toothed bone hair comb

Dry flat or round brushes Fitches of several sizes

Oak check roller Oak grain finisher Crayons of corresponding

colours to the graining colours

Chamois leather and small pieces of chamois leather

Sponges of various sizes and textures

Palette for oil colours

Palette (large earthenware plate) for water colours

Applying Colour

Oil Rubbing in brushes are used to apply the graining colour and the process is known as rubbing in (Fig 3) The small brush is dipped into the prepared glaze and several dabs or streaks are laid on the upper panel mouldings of a door Thus material is spread evenly with the large brush following up on the panel and other portions of the door

An area once commenced should be rubbed in throughout An edge should never be allowed to set where other glaze may have to be laid or shadiness will result If there is a break and the colour has been worked over it the craftsman should take care to wipe clean beyond this line or break He should never leave dark patches near the mouldings at the top and *bottom of a panel or they will show* in the finished work

Laying in or graining a door follows the same order as in plain painting, that is panels and mouldings middle stiles lock rail top and bottom rails and meeting stiles

Water The procedure differs from the above, as water colour will not remain wet long enough for a complete door to be grained in One panel should be laid in at a time the stiles being wiped clean from any colour which may have been brushed on When the panels are finished the cross rails are grained a clean straight joint being wiped where they abut against the stiles When brushing in the stiles, the back edge of a steel comb should be held along the line of each joint to keep it clean (Fig 4)

Oily Ground Colour If the ground is too oily, water-colour glaze may ciss that is it gathers in small globules leaving large bare patches To check this tendency the ground may be rubbed over with damped whiting on a sponge When dry, loose whiting must be dusted off

Fig 4. Applying the back edge of a steel comb to obtain a clean joint between rail and stile of a door when using the drag

A study of pieces of quartered oak (Fig 5) will reveal that

1 (*a*) The straight grain is of varying widths (*b*) the pore lines are not continuous
2 The silver grain falls into well-marked divisions

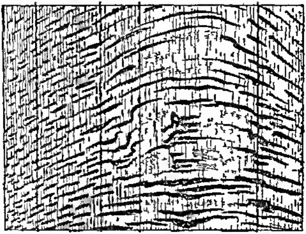


Fig 5 Upright division lines indicate the changes in formation and spacing which take place in oak.

of (a) Broad long lines or stumpy clashes with fairly wide spaces between (the long lines are not always continuous but may be of several pieces slightly overlapping, giving the impression of continuity), (b) lines of medium length, more closely spaced and more regular in formation, (c) small short clashes in close formation, (d) small clashes more widely spaced and gradually fading into the straight grain

Silver Grain

The flow of silver grain is always rhythmic, each clash appearing to slide away from the previous one, they do not lie end to end as is sometimes seen in graining The broader the mark, the greater the plain space surrounding it Half tones occur in the larger spaces between the broad figure When the tree has been bent to any extent or when a branch enters the tree it is obvious that the grain and clashes will also change to the same degree, but if the foregoing points are looked for it will be easy to understand the change (Fig 6)

The graining colour having been laid as suggested the straight grain may be put in either with steel and rubber combs or with a drag or brush graining tool

The combs are drawn the full length of the panel and wiped clean on a piece of rag, held in the left hand, after every stroke This leaves continuous lines of broad light streaks alternating with dark narrow ones Another narrower comb, usually with a few teeth removed, is used with short diagonal strokes to break up the continuous dark lines

The drag may be used without combs This produces a less hard effect, with the dark lines already broken by the movement of the bristles down the panel

Of the two methods the latter is the more general to day It saves time and the effect of grain is obtained more easily However, there is a danger of being too quick and of obtaining a patchy finish, especially close to the top and bottom of panels There is no doubt that the combs, in expert hands, produce better and cleaner results

Wiping out the Clashes or Silver Grain A clean piece of rag is placed over the thumb of the right hand and held by the loose end in the fingers of the left hand The nail of the thumb is the working part and if kept the right length

is the best 'tool' for the job, it is sensitive and is always there when wanted Failing the thumb a flexible piece of horn may be used, it is held in position by the first finger and thumb of the right hand The rag may be of single thickness or folded twice or more according to the width of the mark to be wiped out

The wiping out is important If the rag is unsuitable or is so saturated with colour as to be non absorbent, the colour is pushed on one side leaving ridges where in the wood there are depressions After every few strokes the rag must be pulled slightly with the left hand to present a clean surface to the work

The larger marks should be taken out first The craftsman need not always work direct from top to bottom of the panel but may move about in order to get the design right It is wrong to work a small section right across the panel and then put in other sections below The medium and short clashes support the design they should only be put in when the main lines have been fixed This does not mean there is no design in the small marks—quite the reverse, failure to recognise this spoils many a man's work and a few short clashes wrongly directed stand out prominently

The half tones are taken out by folding the rag into a soft pad with a straight working edge and lightly dragging it over the larger spaces between the more prominent markings The broad rubbing in brush used very dry is drawn gently down the panel to soften the clashes break down any ridges of colour left and produce a little darker shade below the figure grain

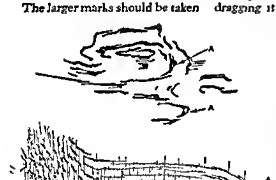


Fig 6. The pieces of silver grain indicated by the letter (A) are characteristic features by which the direction and flow of grain are changed

The framing parts of a door are usually of plain straight grain or at most, only flecked with figure The lock rail may be figured or may contain heartwood supported by figure (Fig 7)

To grain in the heartwood the rag is placed on the thumb as before and one of the intermediate oval shapes drawn in first,

leaving the centre to be filled in afterwards The ends of the ovals should be put in with a zig zag motion, leaving narrow serrated lines of dark colour against large wiped out spaces The lines should be thin and close together at the sides After the heartwood has been put in, including the centre, a comb or the drag should be used to draw out the ends of the grain The figure radiates from the centre lines of the heartwood

The glaze is allowed to dry and then prepared for the water colour by sponging damped whiting over the surface to prevent cissing On top of the rollers of the roller over-grainer is laid a feed brush charged with Vandyke brown in water As the rollers revolve, the colour is transferred, by the serrations on the disks, from the brush to the panel It is advisable to make a few trial runs to ensure that the colour is working over the rollers correctly The feed brush may be one of the mottlers broad enough to cover the full width of the tool

Using the Mottler

The roller is worked up the panel, leaving segments of pith or pore marks following the course of the straight grain These are allowed to dry and followed with a thin wash of Vandyke brown, applied with the broadest mottler over the whole surface While the latter is still wet the badger softener is drawn also down the panel, following the straight grain

Finally the craftsman wipes out the dark marks which have run through the figuring These pore or pith marks never overlay the figure The last two processes are often omitted, and more especially if the wood is to be light in tone

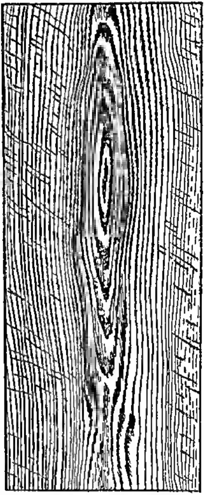


Fig 7. Heartwood which is sometimes used in lock rails and suchlike as a variation to silver and straight grains

Wood laid horizontally is lighter in tone than vertical pieces and this should be allowed for in the over-graining Many grainers, probably through lack of knowledge, over-accentuate this variation, and in consequence their work has a cheap, unreal appearance which is conspicuously noticeable

Pollard oak formation is caused by the deliberate act of man, in cutting off or polling branches, and

by the work of nature in healing the scar caused The straight grain already twisted by the junction of the branch with the tree, is made still more tortuous by the effort to heal the scar Small scab like formations are formed which penetrate into the cut limb

Darker Cross-sections

All cross sections of branches entering a tree are darker in colour than the remainder of the wood but *in pollard oak this darker* colour permeates the surrounding area and results in richer coloured wood with a distinct contrast of tone in streaks and patches The figure is also affected, it twists and turns about the knots sometimes disappearing altogether

Brown oak is taken from the same part of the tree but the cut is made in a different direction, and the swirling of both grain and figure round the longitudinal section of the knots is clearly demonstrated

Graining Pollard Oak The ground colour should be composed of white and Oxford ochre with a touch of orange chrome The graining colour is burnt umber and raw sienna ground in an oil *medium*.

Rub in the panel with the graining colour, With a scrubbing motion of the rubbing in brush put in the swirl of the main lines work the brush into some stiff umber on the palette and, following the same direction, add darker and rather scratchy streaks.

Dip a small short bristled tool or fitch into the glaze, the latter being slightly darkened with umber and work a cluster of scars or knots among the swirling lines somewhat like the swirling of water around half-submerged stones in a running stream With the same brush, now used fairly dry, work in the lines of the grain about the knots

Insert the fine figure in and about the groups of knots This may be put in with a steel comb, from which some teeth have been removed Introduce the larger figures worked in with a rag on the thumb on the less knotty parts of the panel Allow the work to dry, thinly glaze with Vandyke brown *in water and take out the* high lights with a piece of chamois leather or a sponge, or both

Oak Varieties

Other varieties are American red oak, colour, light and reddish-brown, figure, not so pronounced as English oak American white oak, colour, yellowish light brown, figure marked silver grain, coarse straight grain

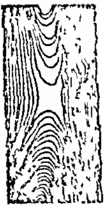
The characteristics to be represented in a number of varieties of oak may be summarised as follows

Australian silky oak Colour light brown with a pinkish tinge, figure silver grain stumpy, and angular

Japanese oak. Colour lighter *than English, figure silver grain,* softer, more regular than English

Slavonian oak (Austrian) Figure fine but large and less hard than English

Oak may be described according to colour or pattern as Plain oak brush grained or combed Wainscot light or medium figured oak Dark oak having a *closer figure* more pronounced half tones and greater contrasts Root of oak as pollard but suggesting growth and upward surge Heartwood ("sap") Weathered oak bleached to a grey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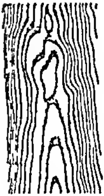
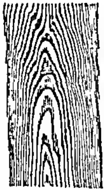

YELLOW PINE


ENGLISH ASH


HUNGARIAN ASH


AMERICAN WALNUT

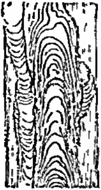

ROSEWOOD

Fig 8. The craftsman should carefully note the variations in the flow of the line, the hardness or softness of the line and the relative areas of light and dark and compare one against the other

tone as if by sun, wind and rain Antique oak darkened to a rich mellow brown as if by age and usage Limed oak a variety which arose from the stripping of coats of accumulated limewash from the surface, some of this remained in the pores to give a grey bleached tone to the wood Fumed oak treated with ammonia

It is not necessary to describe the methods of graining a large number of woods (Fig 8) The range has been greatly extended by many beautiful examples of empire woods, to lay emphasis on the species most commonly represented tends to ignore this widened field

The object here is rather to suggest methods of carrying out

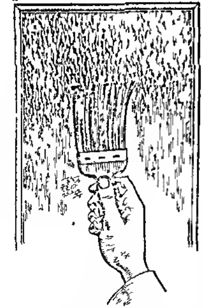


Fig 9 Graining colour usually water medium is spread evenly over the surface and flogged with the tip of the brush to obtain a fine pore like effect such as is found in mahogany

operations, permitting the grainer to apply them as he thinks best For convenience of study the specimens have been divided into several broad groups The grouping is sufficiently comprehensive for any wood not mentioned to be classified and treated according to the suggestions for those in a particular group

Grouping of Woods

1 (*a*) Woods cut plankwise from the normal growing tree in which the principal feature is strongly marked heartwood supported by the straight grain of the radial cut and often enhanced by mottle chestnut, pine, pitch pine western red cedar, cypress and elm

(*b*) Woods in which the mottle is pronounced; the heartwood lines often taking secondary place cherry birch English ash Hungarian ash, and sycamore

(*c*) Woods of less contrasting tone and colour in both grain and mottle American walnut, figured mahogany, and teak.

2 Woods which have suffered injury by man by insect pests or by wind and storm, and in which many beautiful effects have been caused through nature s efforts to repair the damage burr walnut bird s-eye maple, and pollard oak

3 Feathered mahogany, satinwood, and rosewood

In Group 1 the chief characteristics are heartgrain straight grain, mottle and pore marks In Group 2 the same features are represented, but they are turned from their natural course

In both feathered mahogany and satinwood, beautiful feather like

effects down the centre of the heart-grain indicate the origin of the name The craftsman should become familiar with the various methods employed to represent each of these features

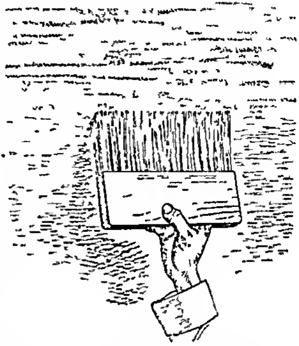


Fig 10 Obtaining the silvery formations seen in mahogany satinwood, maple etc., by use of the mottler

Pore Marks

1 They may be made, as in oak, where the straight grain lines left by the broadcomb are crossed by the narrower comb
2 Laying an even oil glaze, and using a fine-toothed steel comb, the surface is crossed and re-crossed until it presents an even texture of short lines
3 The check roller may be used, as described in oak graining
4 The ground may be covered with water or oil colour and flogged with the flogger until a fine pore-like effect is obtained (Fig 9)
5 Stippling with the ends of the badger or duster brush while graining in water will give an appearance of pore marks as in walnut and mahogany

Mottling

Mottles are the silvery formations which ran across the grain and give to many woods a satiny sheen This work is usually done in water It may be carried out either as a first operation, or later if the design is directional, as in feathered mahogany, or positional, as where round knots are used to introduce high lights

First Method The ground is covered with a glaze and flogged or stippled to remove brush marks The mottling is done by folding a damp chamois leather and rolling it down the surface

Second Method Take a mottler (Fig 10) in the right hand and a damp leather in the left Wet the mottler with water wiping off any excess with the leather Start at the top of the panel by placing the mottler lightly on the wet glaze and with a rocking motion, only occasionally lifting the left corner from the work, take off the colour in irregular horizontal formations down the panel Avoid leaving vertical divisions by slightly overlapping each section across the panel When the mottler becomes

charged with colour, wipe it clean on the leather

While the colour is still wet draw or flick the badger softener across the panel to emphasise the horizontal effect and partially connect up the mottles The short 2 in camel hair mottler is used when high lights are required to be sharp and of definite shape

Heartgrains being of various textures and formations require varying processes Five methods are here described and with each is included a list of woods which it is suggested may be treated by that method These are only suggestions made purely as a guide

The groups have been arranged as a gradual development from the simplest methods and grains to the more intricate and subtle variations

First Method Oil

Tools rubbing in brushes fitch pencil and badger

Woods cedar cherry pitch pine pine birch and elm

Laying on Colour

Lay in the panel with the graining colour keeping the centre lighter in tone than the sides and free from vertical lines Use the badger to soften the colour or stipple or flog to suggest pores Otherwise the main lines of the grain may be faintly suggested by working the rubbing in brush used fairly dry in the direction the grain is intended to take

Note that the centre heartgrain of the panel is *put in* by colour on the fitch and pencil and the straight grain *taken out* by the combs Therefore unless the centre is made lighter the general tone of the panel will be irregular

A study of the woods mentioned will indicate the tools to be used Cherry heartgrain is rather thin and widely spaced Use a long haired pencil of either ox hair or sable for the centre grain and rubber combs for the straight badger away from the centre of the oval shapes and cross the ends of the grain to produce a light and dark line

In western red cedar the lines are fairly regular in width but broader than in cherry

Producing Half-tones

For pine and pitch pine comb the sides with a rubber comb and take a fitch for the heartgrain which after being put in should be well badgered to produce half tones Sharpen the inside edge of the oval forms with colour used in a pencil

Elm requires a flogged ground left coarser than usual The very coarse texture of the heartgrain is worked by using a fitch charged with colour with a zig zag motion as the lines are put in

Second Method Oil

Tools rag and thumb-piece combs pencil and badger

Woods ash Hungarian ash teak and oak

For teak wipe out the heart grain with rag placed on the thumb-piece as suggested for oak graining using combs for the straight lines Employ the badger fairly strongly as the wood is medium toned without much contrast between light and dark shades The grain may be sharpened up with a sable pencil in colour

To represent ash and Hungarian ash wipe out large areas of the colour to show the ground and make the contrast in tone more pronounced Use combs to pull out

the broad ends of the ovals, showing where they are cut into by pores, and then badger in the same direction

Third Method Oil

Tools rubbing in brushes, overgrainer, pencil, and badger

Woods walnut and figured mahogany

Introduce the pore marks in water colour and allow them to dry These woods are marked by halftones with a *few* stronger lines sharpening the grain

Rub in the graining colour very thinly and finish the brushing in the direction the grain is intended to take

For walnut with a pencil *strengthen the heartgrain* at fairly wide intervals and use the separated overgrainer for the more closely spaced straight grain In order to soften the lines, use the badger with vertical strokes

In mahogany the lines of straight *grain* are not continuous When laying in the colour let the final brushing be done from both ends of the panel, so that the lines are broken The heartwood is in continuous lines laid with the *pencil* Use the badger to soften these lines

Improving Appearance

The appearance of these woods may be improved if, when the glaze is partially set, lines are made on the *inside* of the *heartgrain ends* using a pencil charged with turpentine only Use the badger outwards from the centre cutting across all these lines to lift the colour softened by the turpentine leaving a thin lighter line When dry damp down to prevent cissing and put on a thin glaze of water colour With a damp mottler put in the mottle to *radiate* generally from the centre line of the heartgrain The work is now ready for varnishing

The *overgrainer* is a thin brush of hog bristles set in metal holders of convenient width The bristles are generally 2½ in to 3 in long The width varies from 2 to 3 in An ordinary bone hair comb with thick and widely *spaced teeth* is used in conjunction with it The sable or hog hair pencil *overgrainer* has *a row of pencils fixed* in a holder, and is used when regular and evenly spaced lines in rotation are required

Using Overgrainer

Without having in mind the *grain of any particular wood*, practise with the overgrainer to assess its possibilities Prepare a board in light cream oil paint, put on a thin coat of water glaze, using Vandyke brown as colouring and mottle or stipple When the ground is dry place some Vandyke brown on the plate palette and work up some of it thinly in the centre of the plate Wet the overgrainer partially dry it on the chamois leather, and drag it through the colour on the plate Separate the bristles of the overgrainer by pulling it through the comb Holding it as indicated in Fig 11 proceed to design the grain Remember that lines at the side should be close *together that is* across the width *of the tree* while in the upward growth they open out and themselves become broader

It will be found that in some *woods the formation* is clean and precise while in others the lines may be wavy, irregular or even broken In some panels the formation develops into further whorls *of concentric ovals,* some lines

running round these, while others still keep to their upward trend Practise all these variations, using a wet and a drier brush, light and darker colour and so on

With a wet brush, that is, one charged fully with colour, the lines flow out into each other as seen in Italian walnut With a darker and *drier brush there is greater precision* and contrast of tone

Badger Softener

The badger softener is an almost magical tool which can be used for *numerous operations in many different* ways (Fig 12) In theory it is just a brush of the softest possible hair used to soften harsh markings In practice the craftsman can use it to soften, blend, stipple or flog, or can *drag it down* the surface to put in grains

On the work which has just been overgrained, and while it is still wet practise using the badger to brush up the ends of the ovals as previously described If the surface is brushed slowly the lines will be blurred or softened If flicked with a sharp motion the brush will drag the vein into serrations to represent pore marks and texture

Practice in making pore marks, mottling, overgraining, pencilling, and badgering is better than the *slavish copying of a few woods* It brings facility in the use of tools and a knowledge of the media which lead to confidence in one's ability to grain any wood asked for

Fourth Method Water media and *colours*

Tools dry rubbing in brushes, overgrainer, bone comb, fitch, pencils, chamois leather, badger, broad mottler, and ragged sponge

Woods elm, chestnut, pitch *pine*, pine, and *oak*

A stippled, flogged, or mottled ground is appropriate for these woods With the broad mottler lay in a thin wash of medium quickly over the panel, leaving the sides *darker than the portion to be* occupied by the heartgrain Should the pore marks or mottlings have been done in water colour, as is usual, the colour will lift if worked too much It is to avoid this that the broad mottler is used to lay in the colour quickly and without much brushing When this is dry, take a fitch charged with colour and put in the oval formations of the heartgrain Keep the badger in the left hand for softening the work before it dries Put *in the side* grains with the overgrainer Sharpen the grain

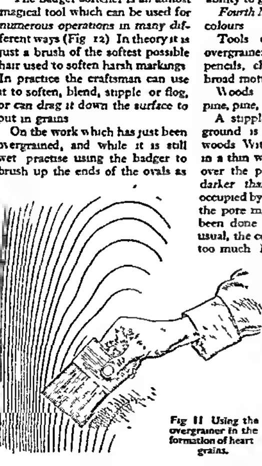


Fig 11 Using the overgrainer in the formation of heart grains.

with the sable pencil and when necessary again use the badger for softening

Fifth Method Water media and colours

Tools as for fourth method

Woods walnut, figured mahogany, rosewood, satinwood, and teak There is a fair amount of work in all these woods, so that when the pore marks have been put in it is advisable to bind the colour with a thin coat of gold-size and turpentine Frequently the pore marks are not put in until later, the graining being started on the ground colour

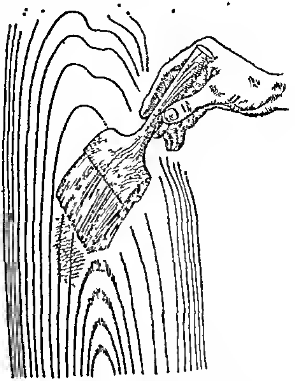


Fig 12. Dragging out the ends of the whorls in heart grains with the badger softener

The formation of mahogany and satinwood is similar, colour is their distinguishing feature For either, rub the graining colour over the panel Take the wetted ragged sponge, wipe out the grain and *soften* with the badger, *slightly* across the grain Follow these lines with the overgrainer worked into a slightly darker colour and again soften

For teak and walnut rub in, flog for pore marks allow to dry, put in the grain with the overgrainer, and soften with the badger Use the pencil to emphasis some of the lines

The procedure for rosewood is similar, but the unusual markings must be well studied so as to reproduce the character and variations in tone of this wood Glaze over some portions to obtain the tone contrasts

A fuller description is necessary of the methods for graining Italian burr walnut, bird s eye maple, and feathered *mahogany*

Burr walnut Colour of wood brown with golden streaks, sometimes with black and purple markings

Ground colour rich medium tone

Composition of ground white, orange chrome, Italian ochre

Graining colour Vandyke brown burnt sienna, blue black

Binding medium stale beer and water

Tools and *equipment* bucket or large paint kettle half full of water, large earthenware plate as palette,

rubbing-in brushes mottlers, overgrainer and bone comb, cutter, sable pencils, fitches, ragged sponge, chamois leather, badger

Mixing the Colours

Place some stiff Vandyke brown and burnt sienna on the side of the plate Charge the rubbing in brush with the medium and dip it in each of the colours on the palette, mixing them slightly Rub the brush over the panel, in streaks where the design is to be fairly plain, scumbling the colours where knots are to be shown With the ragged sponge, draw in the straight grain and finish with *twists and dabs of the sponge* in the knotty areas softening with the badger As several more coatings will be applied over this it should be light in tone, giving a shadowy effect with slight changes of colour

While the main lines of the design have become fixed during this operation, accidental effects will have occurred of which advantage can be taken when elaborating the design For example burr *walnut* can *only be procured in* thin veneers which before being mounted may contain several holes of relatively large size, pieces of veneer are inserted in these holes and a close examination of a piece of this wood will always disclose where the matching has been done This should be included in the grain In the area left for groups of knots put a thin wash of the two colours and dab with wet sponge

Follow this by applying colour with the sponge, using a twisting motion as it is applied Take up the overgrainer, charged with the mixed colours and medium. Draw it through the teeth of the bone comb to separate the bristles and go over the panel, following the same general direction as with the previous coat, but working round the knots Soften off across the grain before the colour dries Emphasise prominent lines and markings with the pencil drawing in shapes on and about the knots When dry, glaze thinly over the work, leaving some portions light, as indicated in the wood

Pore marks may be put in at this stage by a splatter method. Charge a short mottler with colour, hold the comb a short distance from the work and rub the brush along the face of the teeth. This splatters *spots of colour through the spaces* between the teeth The spots must be pulled into short lines with the badger before they dry Fasten the work down with gold size and turpentine Damp down when dry and put on another thin glaze of colour, which should contain some black. With a wetted mottler or cutter take out the mottle and high lights When this is dry, the work is ready for varnishing

Bird's-eye Maple

Bird s-eye maple Colour of wood pink to rose red

Ground colour pinkish white

Composition white, with a touch of Venetian red and a smaller touch of orange chrome

Graining colour raw sienna, blue-black, burnt sienna

Binding medium as for walnut

Equipment as for walnut

Tools rubbing in brush, mottler, bird s-eye dotter, chamois leather, badger crayons A dotter can be made by cutting short a No 6 camel hair water-colour brush and burning out the centre and one side with a hot skewer

Take the colour from the palette

with the rubbing-in brush and spread it evenly with the mottler While the panel is still wet, take the damp leather, made into a crumpled roll, and roll it down the surface, keeping the ends rather higher than the centre Do this all over the panel, always taking care slightly to overlap the previous working Take the badger and with a swinging motion soften off the mottle horizontally This should leave patches of light ground into which the eyes are inserted

Charge the dotter with thin burnt sienna and make the eyes in these light patches Use a brown crayon for the grain, it maintains an evenness of line and enables the work to be done more quickly than with colour on a pencil Work the grain round and about the eyes, never through them A rich effect is obtained by first fixing the work done, giving it a light glaze and then taking out high lights, branching away round groups of knots

Mahogany

Feathered mahogany Colour. varies from cool brown to rich dark red

Ground colour Venetian red, yellow ochre, orange chrome

Graining colour Vandyke brown, burnt sienna, drop black, mahogany lake

Equipment and tools as for walnut

Mix the graining colour on the

GROUND AND GRAINING COLOURS

The ground and graining colours for a number of timbers may be summarised as follows

	Ground	Composition of ground	Graining colour
Oak, light	Light buff	White ochre, raw umber	Raw umber
„ dark	Dark buff	Ochre, burnt umber, white For warmer ground add Venetian red	Burnt umber and black
„ weathered	Light grey	White, raw umber, black	Raw sienna, crimson lake, ultramarine blue
Mahogany	Rich buff (red shade)	Venetian red, ochre, orange chrome	Vandyke brown
Black American walnut	Cool buff	Burnt umber Venetian red white	Burnt umber, touch of Prussian blue
Pitch pine	Warm cream	White lemon chrome Venetian red	Raw sienna burnt sienna raw umber
Teak	Medium buff	Yellow ochre, burnt umber Venetian red, white	Burnt umber
Satinwood	Pale warm yellow	White orange chrome touch of lemon chrome	Raw sienna burnt sienna Vandyke brown
Birch	„	„	„
Rosewood	Bright orange red buff	Orange chrome, ochre, Venetian red, white	Mahogany lake, Vandyke brown, drop black

Marbling Colours	
Predominating colour agents	Colour
Carbonates and oxides of iron Manganese Decayed vegetation (carboniferous) Copper	Yellows and reds Black and greys Blue, black and dark brown Green and blue-green
Soda, sulphur, and the heat within the earth's crust extend the range of the colours	

palette, using Vandyke and sienna Lay in the panel, leaving a broad line of darker colour where the centre of the feather is to be With the ragged sponge work upwards from the side of the panel to the line of the dark patch Do this on both sides, making one side more acute in line than the other

Take a mottler and, starting from where the sponging finished, work the formation downwards into the dark area holding the badger in the left hand to soften the work as it proceeds

The softening should be in the direction of the line that is upwards from the centre, following the bend of the line, and upwards from the side of the panel so that the softening from both directions meets at the apex of each section of feather Dabbing with the softener if carefully done, will insert pore marks without disturbing the line

Emphasizing Fine Lines

With a short mottler or cutter emphasise some of the finer irregular lines which go down into the centre of the feather Allow the work to dry Charge the overgrainer, drag it through the comb *and put in the grain which runs* across the feather

Allow the work to dry and bind it down When this is dry, overglaze with mahogany lake and a touch of black in preparation for mottling The latter process is done across the side grain and radiating from the feather, which is usually lighter in tone on one side When dry, apply varnish

Marbling

In practice, any natural stone of close texture hard enough to be polished, but less hard than granite, is called a marble

The basis is mineral calcite or rock limestone combined with other materials and salts of metals which add colour and variety of tone

The purest marbles are those near white in colour, such as the statuary marbles of Carrara, in Italy

Those which have been coloured to a more or less even tone throughout are said to be unicoloured An example of this class is Hopton Wood stone

A textured or cloudy ground crossed by veins of stronger colour is termed variegated Its origin can be traced to the earth's movement having fractured the bed of marbling so allowing the infiltration of coloured silt

Laminated marble has been formed by the silting of colour-impregnated minerals in layers Sometimes the colour would run

strong at other times weak Other colouring agents would add their quota until, when the marble had been fully formed, there would be a lamination of different tones and colours

An original bed of marble may have been blown into fragments by volcanic action and reset by pressure, often accompanied by heat, after the percolation of other minerals and colouring agents between the loose bed of fragments In this way brecciated marble has been formed

Serpentinous marble is composed mainly of the mineral serpentine This class includes most of the dark green marbles Some of them are fractured and contain angular pieces of white marble, while other varieties, such as Irish green, are in twisty, variously coloured layers

Travertines include the onyx marbles They are stalagmite and stalactite formations of brilliant colour and a high degree of transparency

Crinoidal marbles are composed of fossilised shell fragments and often contain decomposed animal and vegetable matter

Alabaster is sulphate of calcium or gypsum It is softer than any of the limestone marbles and is easily scratched

Design and Colour

Marble has no regular form of growth such as is seen in wood but very definite design principles are involved although at a glance it would appear that in many examples lines run in all directions and fragments follow no order or rhythm

If a piece of variegated marble (sienna) is examined, it will be noticed that there are main veins which have certain relationship of line From each of these break secondary veinings which join up into an uneven network of fine lines enclosing shapes of multiple area There is balance but not repetition in these designs To understand the forces which have brought this formation about will assist the marbler in his work

Undergoing Change

Visualise the limestone, perhaps already impregnated with patches of colour, settling and being changed into a solid bed of marble Cooling of the earth's crust causes movement which breaks up the bed into large pieces and these, as they begin to settle again, grind together and break small pieces away from the edges of the main fractures While all this is happening colour-impregnated water or silt finds its way into the fractures, leaving them as veins in the recombined marble This has not occurred in a moment of time but has been brought about by steady, slow relentless pressure over a period of years Therefore the veins are sinuous rather than violent

Brecciated marble, on the other hand, has been subjected to violent shattering blows The bed of marble was violently exploded and hurled from its bed to resettle in angular fragments varying in size

Examination of a heap of rubble which has been thrown up shows that the larger pieces have rolled to the base of the heap, leaving fine grit and smaller pieces on top In this class of marble the same effect will be noticed There is a grouping of larger and smaller pieces producing an appearance of design

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Design and Colour

Marble has no regular form of growth such as is seen in wood but very definite design principles are involved although at a glance it would appear that in many examples lines run in all directions and fragments follow no order or rhythm

If a piece of variegated marble (sienna) is examined it will be noticed that there are main veins which have certain relationship of line From each of these break secondary veinings which join up into an uneven network of fine lines enclosing shapes of multiple area There is balance but not repetition in these designs To understand the forces which have brought this formation about will assist the marbler in his work

Undergoing Change

Visualise the limestone, perhaps already impregnated with patches of colour, settling and being changed into a solid bed of marble Cooling of the earth's crust causes movement which breaks up the bed into large pieces, and these, as they begin to settle again, grind together and break small pieces away from the edges of the main fractures While all this is happening colour impregnated water or silt finds its way into the fractures, leaving them as veins in the recombined marble This has not occurred in a moment of time but has been brought about by steady, slow relentless pressure over a period of years Therefore the veins are sinuous rather than violent

Brecciated marble, on the other hand, has been subjected to violent shattering blows The bed of marble was violently exploded and hurled from its bed to resettle in angular fragments varying in size

Examination of a heap of rubble which has been thrown up shows that the larger pieces have rolled to the base of the heap, leaving fine grit and smaller pieces on top In this class of marble the same effect will be noticed There is a grouping of larger and smaller pieces producing an appearance of design

If a piece of cipolin be examined

it will be noticed how, during the ages, the strata have been formed Sometimes the colour is light and the layer broad while other strata are narrow and deep in colour There is no strong movement or violent action here, but rather a steady flow and gradual accumulation of each lamination until the whole bed has been formed and consolidated Therefore the lines of junction are soft and often the colour seeps into other layers

Lime Deposits

Everyone who has been into a cave, and has seen the stalactites hanging from the roof with tiny drops of calcium-impregnated water dropping from their points to form stalagmites on the floor, must have marvelled at the countless number of years which have passed before these formations attained any great size In a thousand years one inch is added to a stalactite, during the same period the water charged with carbonate of calcium may have formed a thin streak of light tinted stalagmite During the next thousand years the water may have found and passed through a bed of colouring matter which has added a streak of another colour and so very very slowly the onyx takes on form and beauty

The colours in marbles are often brilliant and rich although the agents which have given them that colour may be the iron reds or yellows of a less decorative hue The marbler should study these colours and try to produce them looking clean and brilliant using only the same class of material that nature has used The colour is not wholly on the surface It goes deep into the marble and is seen through the semi-transparent crystalline structure

Preparation should follow the lines suggested for graining and be of the same egg-shell finish.

The ground colours suggested are not universally used Some marblers prefer a white ground for all marbles It has been suggested that all black grounds are correct, the argument being that away from light all colour is black and can only be seen to the extent of the penetration of light into the marble, therefore the background is black or without light Others vary their ground to suit the particular marble to be represented The grounds suggested here will be white or near white with a few possible alternatives

The media comprise raw linseed oil turpentine and liquid oil driers

Mixing Ingredients

Materials Oil colours in tubes Crayons can be bought ready for use or made from coloured pigments pipeclay gum arabic, and glycerine Mix together the required dry pigment and pipeclay Add glycerine until the mass will just hold together, too much glycerine will make crayons permanently sticky

Mix in the gum until the paste has the consistency of putty and kneads well Dust a board with some of the dry pigment pipeclay mixture and roll out the paste Cut this into strips 3 in long and of square section They may remain in this shape or be rolled to make them circular Allow the crayons to dry slowly and store in cellophane paper

The necessary tools and equipment are rubbing in brushes, fitches of various sizes, sable and

ox-hair pencils or riggers; sponges of various texture, *chamois leather*; soft lintless rag, bog-hair softener, badger softener, palette with dippers for oil and turpentine, small paint kettles or tins

General Rules

A few general rules for marbling, and certain relevant facts, are given here in order to avoid unnecessary repetition

(1) It should be realised that a marble may vary considerably in design and colour Some *samples may be full of pattern*, others relatively plain The craftsman may find it difficult to realise that both are of the same species In the neighbourhood of Carrara in Italy the marble beds produce statuary marbles, devoid of veins, and variegated marbles Carrara Sicilian, Dore, and Bardilla marble are examples

(2) In two or more different *species of marble veins may be* similar while the colour varies, as in Sicilian and Sienna

(3) The characteristics of veining or massing in each species *should be studied* For example, Porter (black and gold) has chain-like lines as against the more evenly disposed veins of Sienna

(4) Aim at character, avoid equal spacing and repetition of shape in areas enclosed by veins

(5) Never let the colours be opaque, washes of colour suggest transparency and luminosity

(6) Avoid long continuous lines Break them up by the introduction of small veins, overlaying one tone of colour upon another, or changing the colour

Rules for application may be *summarised as*

(1) Before commencing to marble, rub the ground over with linseed oil on a rag

(2) Almost all marbles have a 'broken colour" or cloudy ground and this should be *applied first* *From the range of* colours named for the particular marble select those appropriate for the ground colour Take a large fitch and mix each colour sparingly with the medium on the palette *Place spots on the panel so that* when dispersed they follow the character of the marble With a sponge or soft rag, scumble the spots, breaking them up and impinging one colour on another Soften to a cloud effect with the hog hair softener Some of the marbles have definite textural markings In those mentioned at length the procedure described will *supplement the foregoing*

(3) To insert the veins on a variegated marble, where the lines are soft and sinuous, roll the pencil, using the side (Fig 13) On a brecciated marble with harder lines use the point, or, alternatively, use crayons Veins are rarely sharp enough to be made with one stroke Remember that the vein goes back into the marble and the reflection of this depth of colour must be indicated This is done by first making the lines fairly weak and softening them off, following with a second line, not necessarily of the same colour, and sharpening the effect by a final line of stronger colour or tone

(4) The above rule applies also for

areas or patches of colour Put in a patch of semi transparent colour and overlay it over running the edge in some places and stopping short in others A final coat following the same procedure will give brilliancy and translucency

Individual Methods Dove

Ground white Colours ultra marine blue black zinc white The marble is quiet and restrained in colour The colour was im parted by carbonaceous matter while the mass of the marble was being formed The bed of marble was fractured very little therefore veins are only occasionally seen

Working Method

The method of working is to oil the ground lay in a thin coat of light blue grey glaze formed of medium ultramarine and black take a large feather charge it with turpentine and drag it along in the direction of the strata formation soften off first in the same direction and then crosswise the occasional

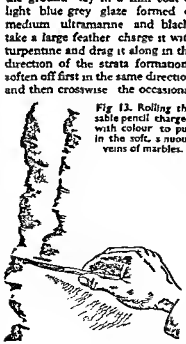


Fig 13. Rolling the sable pencil charged with colour to put in the soft, s nuous veins of marbles.

veins are white crossing the for mation at an angle With a rag used on the thumb as in graining wipe out these veins and follow the same line with a pencil charged with thin white

Variegated Sienna

Ground white Colours raw sienna burnt sienna Indian red ultramarine blue Middle chrome may be included in the scumble but must be used sparingly It is better to sacrifice the additional brightness it gives than to use too much

In all marbles what might be described as controlled accidents have occurred The accidents are controlled by the colouring matter and the forces present which give marbles their chief characteristics, but they are still accidents Con sistent with character the marbler *should be prepared to develop* accidental effects which occur at any stage of the working

Drawing Marble

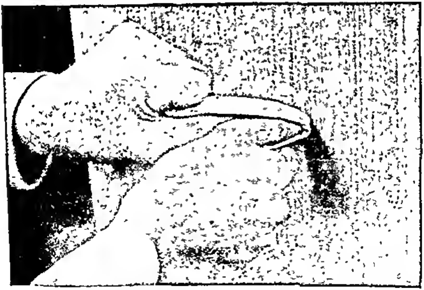
Do not try to draw marble but grasp the opportunities presented to form every detail into a part of a characteristic unit Sienna is a marble which offers these oppor tunities to the full If all the pos sible lessons be learnt from a study of the marbl most of the funda mentals of marbling except cha racteristic markings and colour blendings will be included

The method of working is to oil the ground scumble with raw sienna occas onally making small areas of greyer colour with Indian red and ultramarine worked into the sienna. The effect should be tones of sienna from almost white to a fairly deep colour with grey areas usually placed close to the

PLATE III

PRODUCTION OF MOTTLED EFFECTS

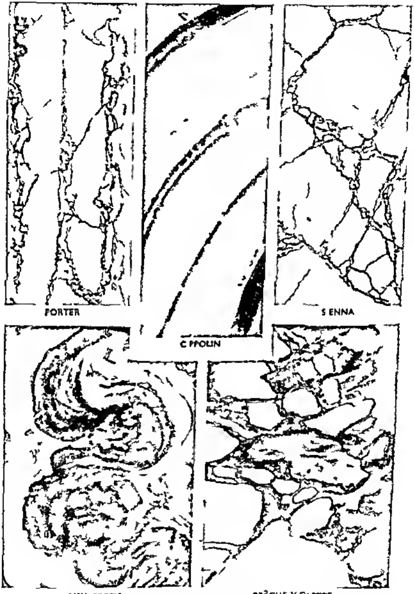
Various mottled effects are achieved by means of scumbling. The finishing coat of paint is rubbed with a sponge so as partially to expose the previous coat.



HOW A FIGURED OAK FINISH IS OBTAINED

Figuring is obtained by wiping out portions of the previously brushed-in straight grain while still wet, using folded cloth as shown. It becomes charged with colour after every few marks, and is pulled over the thumb to provide clean surfaces.

PLATE IV



TYPICAL STRUCTURES OF MARBLE

Marbles vary cons derably in design and colour and therefore the decorator must study the natural material if he des res to achieve real stic results The above illus *trations show formations which are representative of the main structural groups.*

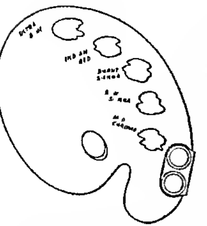


Fig 14 Palette for sienna marbling and how to charge it with the colours

light patches The scumble may be worked with a sponge or a rag Sometimes, in order to obtain sharper contrast the sponge or rag should be moistened with turpentine Soften the panel with the badger

Charge the palette with the colours named (Fig 14) Take a sable pencil and dip it first into the burnt sienna and then into the Indian red using plenty of medium

Do not mix the colours in the pencil They should sometimes appear separately and at others be blended when the pencil is rolled A little ultramarine may also be worked into the veins

Put in the main veins whenever possible taking advantage of the accidentals in the scumble for example a vein may run adjacent to but not on a line of light patches

When the layout has been completed soften off leaving a blurred effect which at first may look much too broad In the finished work this will represent depth or translucency Do the fine veining next, making it colder sharper, and darker. The contrast makes the previous working recede farther into the background The colours used are ultramarine, Indian red and raw sienna, mixed together to make a warm black As these veins are sharper the pencil should be held more upright, bringing the point into play but still using a rolling motion

Porter (black and gold)

Ground black Colours Italian ochre, Indian red, burnt umber, mid-chrome, and white Mix each stiffly with medium and charge the palette

The method of working is to oil the panel, vein direct on this following sienna procedure but paying attention to the characteristic formation As the colours used are more opaque than usual there is a danger of making the work too solid If a solid patch has been made, do not wipe it off but rather spread it about with more thinners Grey patches which occur between the veins can be rubbed in with a rag charged sparingly with thin white Very fine white lines should cross the plainer areas Avoid making these too wide

This marble may be worked from a white ground

Scumble the colours in water colour and allow to dry Cover the surface with spirit black and allow partially to dry Charge a pencil with turpentine and take off the black where the veining is to be, disclosing the water colour beneath To form the grey patches rub off some of the black Scratch out fine lines with the wooden point of a pencil

Breccia Violette (brecciated)

Ground white Colours Indian

red, ultramarine blue, ochre, crimson lake

The method of working is to oil the panel, working in blue and crimson shading by smearing the oily rag sparingly with these colours This marble is a mass composed of various colourful and tone-contrasting units To represent these, sable "one-stroke" brushes may with advantage replace pencils The one-stroke brushes can be used edgewise, to give fine lines, across the width to put in broad spaces or by rocking to vary the formation

Insert in light colours the relative area occupied by each stony unit With a slightly darker colour, shade in these stones and draw round the white calcite fragments, using the softener very lightly With very thin white overlay the white areas with a generously applied wash Fine lines crossing the coloured area can be taken out with the wooden end of a pencil

Verde Antique (brecciated)
Ground black Colours light and dark Brunswick greens, Venetian red, and white

The method of working is to oil the ground, take a large feather and rub the hand down it to break up the edge Charge the feather with a pale sagy green (light green broken with red) and scumble over the surface Do the same with a darker tone of green in a slightly different direction making a meshlike effect with the two tones of colour

With thin *white on a one-stroke* brush put in the angular calcite fragments, paying attention to the way these fall into lines and groupings

Wipe out the angular black patches afterwards dragging over them a fairly dry one-stroke brush, charged with black, to put in a few straight lines

Overlay the white patches with another thin wash of white

Cipolin (laminated)
Ground · very pale grey Colours zinc chrome, Prussian blue, Vandyke brown

Method of working is to oil the ground Lay in the formation with a 2-in brush charged with thin yellow Work a little blue into the yellow and again follow the same direction, commencing where the dark colours are to be and going over the light laminations as the brush becomes drier Charge the brush with blue and brown in the same way and gradually build up the tone and colour contrasts Soften slightly Put in with a pencil the thinner lines of dark colour and again soften

Stippling

Stippling may be broadly defined as the dabbing of a wet paint or glaze with various tools to obtain textural effects upon a prepared surface

Tools hog hair stipplers obtainable in various sizes but averaging 6 in by 8 in, rubber stipplers — strips of rubber of various widths, set in the form of a flat brush to produce coarser textures than are obtainable with the hog hair stippler More irregular stippling may be carried out by the use of sponges (Fig 15), crumpled paper, or cloth

The media are distemper, water paint, flatting oil paint oil or water glazes low relief plastics

The method to follow is

(1) To obtain an even texture with the hog-hair stippler in any of

the media and in one colour The object is to oblit erate all brush marks and to give a uniform flatness to the whole area

Lay in the medium with ap propriate brushes and before it has had time to set take up the stip pler and lightly dab or strike it against the sur face taking care not to miss any portion of the work Lay in the next section and commence stip pling along the junction of the two sections and continue in this way until the whole area is completed

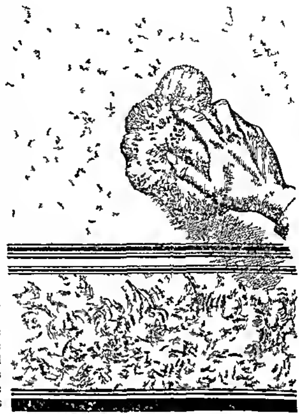


Fig 15 Effective stippling with a sponge Straight dabbing (top) and dabbing and twisting (bottom)

Several points should be ob served with care When first the stippler is taken up the ends of the bristles must be smeared with the material being used Failure to do this will result in bare patches until the stippler becomes charged with material from the surface (Fig 16)

If the stippling does not im mediately follow the laying in the material which usually contains a large proportion of volatile liquid will have partly set Attempts to touch up any such portions will cause a smeary patch on the surface

When a flatting oil paint is being used the final undercoat must be of rather oily com position and must not be allowed to become too hard before the final coat is put on The flatting paint should be mixed and strained some hours before it is used This allows the turpentine to lose some of its harshness and results in a more complete amalgamation of the various ingredients with a smooth working paint

(2) To shade or blend a wall sur face in two or more colours using (for example) pale yellow at the top and finishing with green at the bottom

Make up a quantity of white

red, ultramarine blue, ochre, crimson lake

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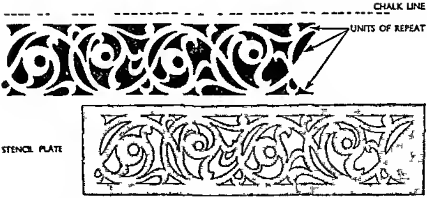


STENCILLED BORDER DESIGN

Fig 17 This attractive running border is adapted from the carved woodwork of Iceland It will be noted that the three essential units of repeat have been indicated

within a given area and the naturalism of the Japanese is totally unsuitable for the purpose There is more to be learnt from Greek Byzantine and Gothic ornament than from all the Japanese stencils The designs of these periods can be studied as examples adaptable to pure stencilling while from the Renaissance period design can be seen in which the stencil may be used as a foundation for handwork If the best examples of the stencil adapted from these periods are studied the methods can be employed in contemporary work, which lends itself well to stencilling

The chief function of a stencil is reproduction either in linear form as a running border as an all-over pattern or as a series of panel units In the first two exactness of repeat is essential and repeating units must be so arranged that the pattern will be repeated in all directions

Running Borders Draw in the unit of design Trace some of the clearly defined ornament from the left hand of the design and transfer it to the right hand end, repeat this operation from right to left The stencil when cut out will include these additional marking units so that it is possible to determine quickly where the second and subsequent repeats will join with the preceding ones (Fig 17)

All Over Patterns To avoid the excessive use of chalk lines an extended key piece is advisable It saves the time employed in setting out and it makes easier the adaptation of the pattern to the area being stencilled (Fig 18)

Panels When a design is symmetrical that is when both halves are alike the design may be drawn on one side The paper is then folded along the centre line and both sides cut at once through the double thickness of paper (Fig 21) When four quarters are symmetrical the paper may be folded and cut in the same way for one half of the panel the other half being stencilled through the first and either cut singly or doubly

Stencils may be classified as (*a*) those which are complete in themselves and require no further embellishment, (*b*) those used as a mechanical means of laying in ornament which afterwards will be

flatting Divide this into halves and tint one half to the lightest tone of yellow and the other to the deepest tone of green Again divide these and make two intermediate tints by adding a proportion of each of the first colours, thus making four graded tints

Set out the area each colour is to occupy and strike lines in chalk As only one wall can be attempted at once, and all edges must be kept "alive," laying in brushes and stipplers will be required for each tone

Commence laying in at the top and follow with the stippler, paying close attention to the blending of each pair of tones so as to secure an even gradation from top to bottom

(3) Shadow or cloud effects may be obtained by laying in irregular patches of several tones of colour and stippling over and around each to soften the colours into each other As there is no even gradation from clearly defined areas, it is possible to work with only one stippler

(4) Stippling glazes Plain painted work gains in richness by having a glaze of semi transparent colour stippled over it The stippling can be of even texture or some portions may be left lighter in tone than others

For example, to lay in a painted door with a light tone of glaze, take a fitch charged with a darker tone and deepen the glaze on and about the mouldings Commence stippling the lightest portions, gradually working back into the darker ones

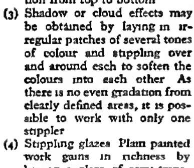


Fig 16. Smearing the surface of the stippler before commencing to use it

Stipplers, softeners, overgrainers, mottlers, and other brushes used in oil paint or glaze need special care

Place a small amount of white spirit in a shallow receptacle, a flanged paint tin lid will do Dip the tips of the brush into the spirit, dab it on absorbent newspaper to clear the bristles from the bulk of the paint, wash clean with yellow bar soap and warm water, and hang up to dry Do not allow the brushes to stand in the water Wash rubber stipplers in the same way and when dry dust with French chalk

Stencilling

A stencil is a piece of thin material in which a design or lettering has been cut out so that the latter can be reproduced by the application of paint or other plastic material through the portions cut out

Reference is often made by writers to Japanese stencils and in some publications Japanese designs have been shown as examples to be copied The lessons learnt from Japanese stencils have been more harmful than beneficial to the decorator in England The English stencil is essentially a medium used to repeat a unit of design

elaborated by handwork (Fig 19)

The design of a stencil is influenced by the ties' which must be included to hold the sheet of material together Whenever possible these ties must be accepted as part of the design, a study of pierced and wrought metalwork, pierced stone and woodwork will assist the designer

Register Stencil

Occasionally the decorator may be called upon to reproduce ornament in which there is no possibility of making these ties part of the design Examples are Greek key patterns and simple meander borders which depend for their beauty upon an uninterrupted flow of line In this case an exact register stencil must be cut to stencil out the ties which have held the first stencil together This must be done while the paint from the first stencil is still wet Any attempt to fill in the ties with a writing pencil or other brush will show as patches of gloss where the colour applied by these means has been laid

The decorator almost invariably uses paper for his stencil and cuts with a knife This also has an influence on the design

The following tools and equipment will be required

Whatman paper is the best stencil paper but is expensive Stout cartridge paper cuts well but is not so strong as Whatman Either paper should receive a coat of linseed oil turpentine and a little liquid oil drier Willesden paper is a tough waterproof paper which stands up to hard wear but is harder to cut than the previous ones

A stencil knife consists of a thin strip of fine cutting steel sharpened to a point, and set in a wooden handle which is bound with string or brass collars In the latter case the blade can be made adjustable by inserting a grub screw in the brass collar Various trades use blades which can be employed in stencil knives, the shoemaker uses a clicking knife blade which is ideal for the purpose

A good pocket knife may be used but it is not so easily held between the fingers It is essential that the handle of the knife be designed to move freely and to rest comfortably in the fingers

Oil stone and non drying oil are required for sharpening the knife

The cutting out is done on a piece of glass preferably rolled sheet which has a harder surface than plate If the sheet of glass is inserted in a table top, injury by the corners to the cut stencil is avoided

Punches provide a ready means of making circular holes They should be of various sizes from ⅛ in to 2 in in diameter When punching place a piece of strip lead under the stencil

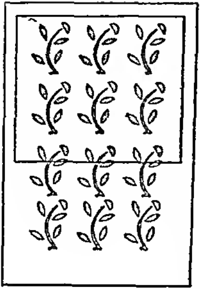
Cutting Lines

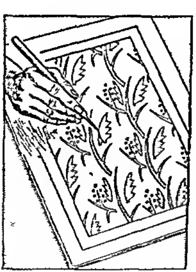
A steel rule and straight-edges are needed for clean cutting of straight lines

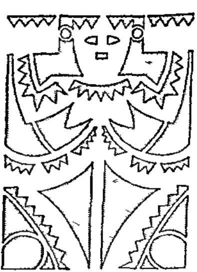
Stencil pins must be used to hold the stencil in position when applying the paint chalk and a chalk line for setting out a palette board and dippers, and small kettles for colours

Stencil tools should be of hog hair closely set in a wooden handle and presenting a firm working surface Cheap loosely made brushes are useless

Tracing the Design Oiling the







STENCIL CUTTING

Fig 18 (top left) shows a sprig pattern using an extended keypiece in the stencil to avoid excessive setting out. Fig 19 (top right) is a positive panel stencil afterwards outlined Fig 20 (bottom left) is a method of stencil cutting where the *stencil is laid on a piece of glass care being taken that the stencil knife is held* perpendicular Fig 21 (bottom, right) is a negative stencil from a primitive design

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Tracing the Design Oiling the

stencil paper has made it semi-transparent and it is possible to see through it a design from which the tracing can be taken Alternatively, the design paper may be rubbed on the back with chalk, placed over the stencil paper and traced by going over the lines of the design with a hard lead pencil

Pouncing Wheel

The design may be pounced by means of a stout needle set in a wooden handle or, for some of the longer lines, by a pouncing wheel When the pouncing is complete, lay the drawing over the stencil paper and with a pounce bag transfer the design If both this and the stencil cutting are done before the oil in the paper becomes too hard, the design becomes fixed to the surface and the paper cuts more easily

Stencil Cutting The knife is held by the first finger and thumb of the right hand (Fig 20) There are two methods of cutting the knife may be pushed along with the thumb of the left hand placed behind the blade to give a controlled *cut of limited mobility*, or the knife may be pulled toward the body without assistance from the left hand This latter method gives greater freedom of movement and is particularly useful when long, free flowing lines have to be cut The two methods may be used on the same stencil but it is advisable to have a knife for each The first procedure is used for close intricate details and the second for more open parts where freedom of movement is essential

In both methods, especially the first, the knife should be held upright This serves two purposes First, only the point is dulled on the glass, the cutting edge remains *sharp for a longer period than if the* knife was held at a slope Secondly, greater pivotal action is possible, short turns can be made more easily and with less exertion

When cutting, never work towards the portions previously cut and never on any account isolate any piece of uncut pattern Both faults may result in slips and broken ties

Broken ties made during cutting operations, or afterwards when stencilling, may be repaired with strips of stencil paper, using burnt knotting as an adhesive Overhanging pieces of the repair paper are then trimmed off

The ground may be either distemper, water paint, or flat oil paint Light-coloured grounds are the best and offer greater opportunities for varying the colour and texture of the stencilling On dark-coloured grounds the most opaque pigments are required to make the work appear solid Titanium white is a good base pigment

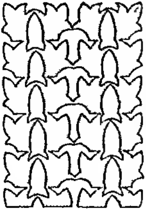
Ground in Oil

The stencil colours should be pigments ground in oil, bound with pale Japan gold size and thinned with turpentine

For stencilling on fabrics the pigments should be ground in turpentine instead of oil On light grounds glazes may be used They give a clean, semi-transparent effect with a minimum of effort

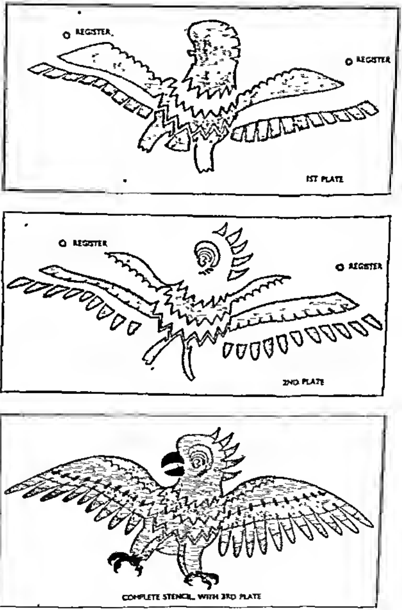
Types of Stencils Negative or background stencils The ground is cut out, leaving the ornament in the ground colour With this type of stencil the necessity for visible ties may be overcome by joining up the ornament *It is often used as a basis* for pencil work (Figs 22 and 23)

Positive stencils The ornament



VARIETY IN STENCIL DESIGN

Numbers of more or less elaborate and pleasing designs can be devised Fig 22 (top left) is a negative stencil adapted from a med eval design Fig 23 (top centre) is an all-over pattern from simple motives Fig 24 (top right) shows a single plate stencil carried out in three colours Fig 25 (centre) single-plate stencil in three colours while Fig 26 (bottom) is a three plate one in three colours.



USE OF THREE STENCIL PLATES

Fig. 27. Here is a three-plate stencil, upon two of which are the register holes. These have to be made in the plates to ensure a perfect *registration.*

is cut out and the arrangement of ties becomes necessary When arranging the ties there is a danger of making the design look too thin, on the other hand, weak ties look ineffective and the stencil quickly breaks down (Figs 24 and 25)

Two or More Colours

When a stencil has to be in more than one colour it is possible, by the use of two or three stencil plates, to arrange the ornament on one to overlay the ties of the others (Fig 26) When using two or more such plates, make a careful tracing of the design and put it over a number of oiled sheets corresponding to the number of plates required Punch register holes at each corner of the pile of sheets When tracing each sheet with its portion of the design see that these register marks are correctly placed For the purpose of stencilling register marks must be arranged by having some piece of ornament cut out in each plate (Fig 27)

Stencilling the Design A fitch is used to transfer the colour from pot to palette Never dip the stencil tool into the paint, but take up paint from the palette Do not use pressure or force when stencilling, light, squarely applied dabs of the tool produce the best results Heavy pressure ruins the brush, damages the stencil, and forces colour under the edges of the pattern

When several colours are being used on a stencil plate one colour may impinge upon the spaces occupied by another This is a feature of stencilling and the slight blending of colours is acceptable

One form of handwork for elaborating the background stencil is outlining of the ornament (Fig 19)

Fig 28 Making use of natural growth in the placing of ties (A and B) Ties to be avoided whenever possible (C and D)

If the craftsman practises lining in this form he will soon obtain a facility with the writing pencil which can be very helpful in the practice of signwriting

Decorative use of ties in stencils form an integral part of the design (Figs 28, 29, and 30)

Lining

Lining with the fitch and straight edge is one of the easiest processes in decoration and it can be one of the most effective A few lines on the plain wall surface of a room will give an individual character and appeal not always obtained with more expensive forms of decoration

Special care must be observed

over two points The use of too much chalk must be avoided when striking lines (Figs 31 and 32), it clogs the paint Secondly for the lining colour pigments should be ground in turpentine bound with gold size and thinned with turpentine *A little raw linseed oil may* be added if the paint does not work easily Always strain the lining colour before applying it

Lining Fitch

Use a thin straight-edge with a bevel cut which is just clear of the surface when lining and hold it firmly in position *A lining fitch* has a diagonal edge which makes contact with the surface when the fitch is held in a natural position After taking up colour from the pot remove any surplus before commencing to line. Never jab the fitch into the bottom of the can The lining should be commenced with the fitch held just as a pencil *is held* when *drawing* and with about the same firmness of grip When being used it must always form a right angle with the wall any deviation from this position will cause spreading of the bristles and result in unevenness of line (Figs 33 and 34)

Start from one end of the straight-edge and carry the line through to the other end, never use short strokes If the line has not been fully put in with the first stroke go over the whole length of line again When running in the next section *work back on the* previous length of line for several inches to make a good joint Frequently wipe the straight-edge clean of paint accumulations

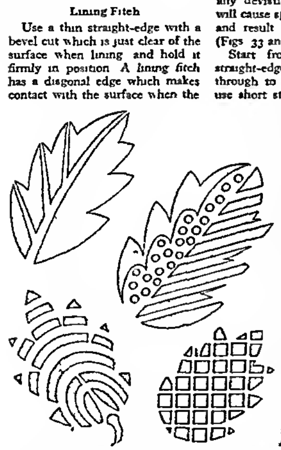


Fig 29 Decorative patterns provide opportunity for introduction of strong t es which while serving their particular function, become an integral part of the design.

Plastic Paints

It has sometimes been argued that the application of plastic paints is an encroachment by the painter upon the plasterer's work This argument is unsound for it is upon the texture of the basic coat that the *painter relies for the colour and tone* of his subsequent decorative finish Were the plasterer to

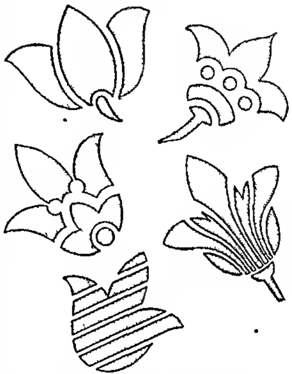


Fig 30 Use of patterns formed by ties in floral forms

carry out this work he would necessarily first have to be shown the working of the required texture, therefore, it is only logical that if the painter can produce the required groundwork, he is the person to carry out the whole job

The relief obtained with plastic paints is rarely more than half an inch and in the majority of schemes is much lower Sometimes only a thin sanded coating is desired

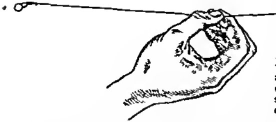
One of the greatest dangers in the use of this material is that the operative should attempt to emulate plaster moulds or modelling It is essentially a material in which freedom of expression and spontaneity is achieved by a diversity of tools In the use of these tools accidental effects often occur which the craftsman can develop into new patterns or textures

Gesso work which dates back to before the Christian era may be considered as the forerunner of plastics, the recipes given for gesso may apply equally to the contemporary plastics Intricate low relief pattern was carried out in this medium and the medieval painters made use of textured grounds and low relief ornament to enrich their paintings and decorations A study of the ancient Roman low relief patterns and of medieval work will suggest methods improve design, and give character to plastic textures and ornament

Restraint is necessary in the use of this extremely ductile material The ease with which the texture is formed may lead the operative to fall into the habit of producing exuberant designs which lack spirit and character

The essential qualities of plastic paints may be summarised very briefly

The material must adhere firmly to the surface to which it is applied Consistently with the relief specified and for the particular brand being used the material must not crack on drying Some plastics of the oil bound type, which on setting only require polishing to develop a gloss, may only be used



STRIKING LINES

Fig 31 Thin string rubbed with chalk or charcoal is attached or held at either end Pulling the string and sharply releasing it makes a chalk or charcoal line on wall

in low relief otherwise they will certainly crack The material must retain its plasticity for a reasonable time so that it may be applied and worked over large areas without recourse to frequent mixings When applied it should retain the desired form without loss of character through setting It should work smoothly under the tools being used and should readily take the types of paint or other finishing materials which may be used to obtain the final decorative effect

The composition may be that of a simple gesso There are several alternatives, such as modelling plaster 3 parts pipe clay 1 part made to working consistency with weak size, modelling plaster, size, and a little glycerine, soaked whiting size, and varnish. Alternatively, it may be a dry powder type of plastic containing whiting plaster of Paris small flakes of mica casein size, and gum arabic or cold water soluble size

The whiting forms the base and gives smooth working qualities Plaster sets the material mica binds it and imparts toughness casein helps the rigidity, while gum or size sets as an adhesive and tends to retard drying while the material is being worked

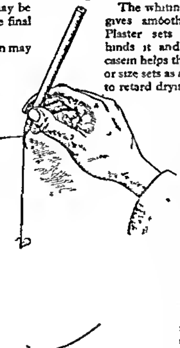


Fig 32. Striking a circular line either in pencil or chalk.

Another alternative is a mixture of 50 parts of an oil-bound water paint with 50 parts of fine plaster of Paris, or modelling plaster, a formula which has some good qualities

Proprietary brands of plastic of either the dry- or oil bound type may be purchased ready for mixing with water

It is important that the painter should have a sound working knowledge

of how to prepare the grounds upon which he may be called on to apply plastic paints

On plaster surfaces large cracks should be filled with plaster Smaller cracks may be filled with plastic

Before cracks are filled in old plaster surfaces any loose material such as distemper should be washed off and any scale such as may be found on surfaces frequently coated with water paint should be removed by scraping

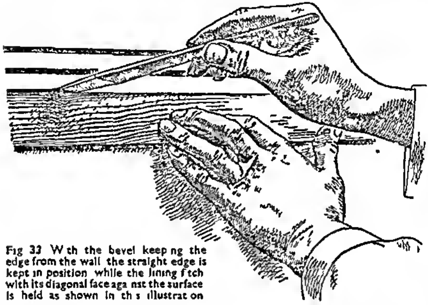


Fig 33 With the bevel keeping the edge from the wall the straight edge is kept in position while the lining fitch with its diagonal face against the surface is held as shown in this illustration

Coat of Oil Paint

A coat of sharp oil paint to ensure even suction of the surface and also to bind any loose material which may be still adhering to it should be applied

Plastic paints are particularly successful on plaster walls which have become uneven or which are so broken by areas of repair work that any other treatment would be inadvisable without the longer and more costly process of stripping and replastering

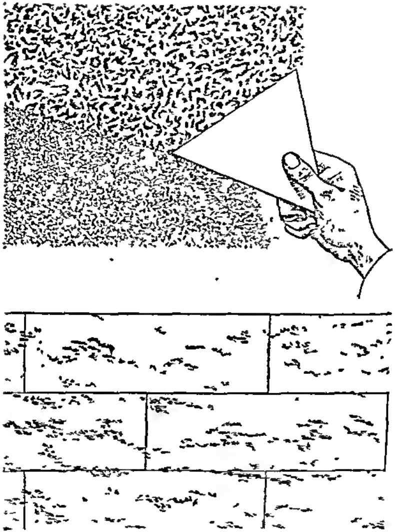
Wallpaper must be removed and the surface treated as above

Oil painted grounds if of varnish or enamel finish should be rubbed down to a matt surface otherwise the material will slide about during application on the impervious and glossy surface and there will be subsequent danger of the material chipping from the surface when hard and dry

Wood requires a priming coat of paint

The tools required are

Six ounce distemper brushes broken in but not worn down and smaller brushes these are used for applying the plastic and sometimes for texturing Hand boards fitted with a bridge handle at the back Combs of steel wood rubber and celluloid with teeth spaced at different widths celluloid is a very satisfactory material to use as it combs clean and is easily washed



PRESSURE WITH THE CELLULOID DRAG

Fig 36. Dragging a flexible piece of celluloid will change the character of the design and lessen the risk of dust accumulation In the lower half the plastic has been allowed almost to set before the lines are cut in to represent jointing

and similar surfaces should be protected with dust sheets Adequate scaffolding to reach all portions of the work should be either erected or near at hand for every purpose

The craftsman should make certain that the mixed plastic is entirely free from lumps There is

nothing more aggravating to the user than to find stiff lumps of material destroying the flow of his design especially when combs are being used Even when only a stipple texture is required the lumps raise unsightly blemishes which are accentuated when the glaze is applied

An adequate supply of material should always be mixed and available to complete each area of surface It is better and more economical to err on the side of a generous supply than to find that a fresh mixture has to be made during progress of the work.

A trial of the material should be made on a portion of the surface to see that the brushing qualities and consistency are correctly adjusted The initial consistency of the mixed plastic will affect the texture If it is mixed stiff the design will be sharp and rugged if thin there will be a certain amount of flow which will tend to give softer and more rounded edges The materials in the latter instance dry out and set with a greater loss of relief than in the former case owing to the amount of water which it contains The addition of more water when a surface is partially completed may cause the texture to take another form from that point If it is found that more water is necessary only a few drops should be added at a time

Fig 37 Mixing powder plastic by slowly sprinkling the powder into water and stirring thoroughly

The plastic is applied with the distemper brush supplemented when necessary by smaller brushes

Working the Texture

One man can apply the material and work the texture providing he can keep all the edges alive during the operations All edges must be kept plastic and not allowed partially to set before the next portion is laid in Otherwise one man must be employed laying the plastic for each man carrying out the texture work

The plastic should be laid evenly over the surface The texturing tools combs or stipplers will not

during and after use, pieces from 4 to 4½ in square should be carried as spares for making new combs The celluloid used for this purpose should be fairly stiff (Fig 35) Rubber squeegee or wooden roller Rubber stipplers Palette knife, chisel knife, broad knife, and trowel Sponges of various textures

All the above are amongst the more usual type of tool which may be used to obtain variety of design and texture

Many other tools may be called into service when occasion demands For instance, an effect was required which could best be obtained by a stiff brush type of tool Of the brushes in stock at the local stores the only one which was of the required length and strength was a circular brush used by the chimney sweep This was cut up and some of the fibre of which it was made was fastened between two pieces of board The tool thus improvised answered the purpose *perfectly* and *the job was quite* successfully carried out

Fig 34 Method of holding the pot of colour within reach when running lines on a ceiling or other overhead position

A flexible piece of celluloid, triangular in shape (Fig 36), is required for dragging over the textured surface for the purpose of (1) Removing sharp points, (2) producing a texture with a *flatter surface quite different from* that left by the texturing tool, and (3) producing a still flatter texture resembling travertine and other marbles and stones of open texture

Stencils of wood metal or card are required for making patterns in relief over the original texture

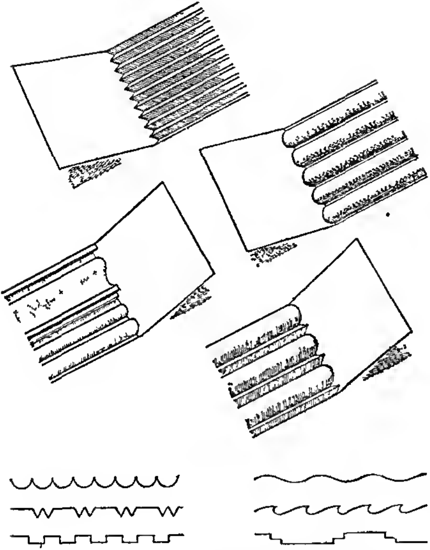
The following notes will indicate the methods of using various types of plastic paints

Water and Oil Water Emulsion type Plastics

Approximately 3 parts by volume of powder are used to 1 part of water

Either warm or cold water is placed in a bucket The powder is sprinkled in stirring all the time until the required consistency is obtained (Fig 37) Usually it is wise to allow these powder plastics to stand for an hour or so after *mixing so that* all *the ingredients* become thoroughly wet

Some proprietary brands of mixing paste and powder plastics are



CELLULOID COMBS

Fig 35 Combs cut from celluloid for carrying out plastic patterns

supplied in this form The mixture of water, paint and plaster may be considered to belong to the same class

One part paste to 1 part powder will be required and a small amount of water may be added when necessary The paste is beaten up into a fine batter and the required quantity of powder sprinkled in stirring until incorporation is complete As the powder in this case is usually the setting ingredient, these mixtures should not be allowed to stand long before use

Before plastics are used all floors

Fig 38 (left) shows patterns of texturing which are carried out with the "laying-in" brush. They do not illustrate the full beauty of the effects produced and only indicate methods. (A) shows "laying-off" at all angles, a design which is effective in the incidental play of light and shade. (B) The light and shade is more rippling and wave-like. (C) The scallop or scale-like formation, is accentuated if the texture is closer near the centre of the swirl giving a change of tone when the glaze is applied. (D) Hat-like form checks the directional tendency and gives a stable effect.

Fig 39 (right) illustrates four patterns achieved by manipulating the brush (A) Stippling with slight pressure to produce an effect half stipple and half suction giving greater contrast in tone of glaze. (B) Stippling with the point of the brush produces more even distribution with sharper high-lights. (C) Pressure and suction with the flat side of the brush, giving more even distribution than (A) (D) Irregular twisting with the brush held nearly perpendicular to the surface.

effect this Where there is either fullness or bareness the design will have greater or less relief, the general effect will be uneven, and the glaze when applied will be darker on the more heavily laid portions

Texturing The main objectives in applying plastics are first to produce a broken surface or pattern in relief textures, richer in incident than the plain surface, with a slight effect of light and shade enhanced by colour in glazes or otherwise, and, secondly, to act as suitable backgrounds or decoration for some specific purpose

Simple Designs

The simpler textures are more successful than more elaborate ones, restraint rather than exuberance should be the keynote The production of pleasing and satisfactory textures is simple if these points are always borne in mind, but if the operative over-elaborates there is soon apparent a lack of the spontaneity, freshness, and quality which are essential to good work

The laying-in brush may also be used for texturing, in fact, as the material is evenly spread the final strokes may form the texture This may be done in any one of several ways, either by "laying off" at all angles, by alternating vertical strokes with horizontal, like a woven mat (Fig 38), by a zig-zag motion, by applying more pressure on one corner of the brush while making short turning movements with the other; by stippling with slight pressure to produce an effect which is half stipple and half suction, or by a slapping motion of the brush used flat, which produces more effect of suction but still retains the brush texture (Fig 39).

A well-worn brush will produce the earlier examples, but with sharper definitions An oval paint brush or large round tool can be used to produce rounded or swirling patterns.

Sponges will produce similar effects, but of more open texture (Fig 40)

Flexible broad scrapers, palette knives, and trowels used on the applied plastic produce a variety of effects similar to rough trowelling, but each knife imparts its own characteristic markings (Fig 41)

Hand boards may be used with only one edge against the wet plastic, to produce designs resembling those obtained with the knives. If they are pressed flat against the surface a suction effect of irregular formation will be seen when the boards are lifted away (Fig 42) If one end be lifted before the other, the formation assumes a tree-like form (Fig 43)

A large wooden roller, similar to that used by paperhangers but preferably of greater diameter, produces effects somewhat like those just mentioned, but the design is more continuous and restricted.

Stippling Brushes

Stipplers may be either of the ordinary bristle type or of rubber with coarse and fine bristles (Fig 44)

Each type produces an even effect over the whole of a surface, the texture varying according to the particular tool used These effects form useful backgrounds for over-spraying pattern in colour or for stencilling a pattern in relief

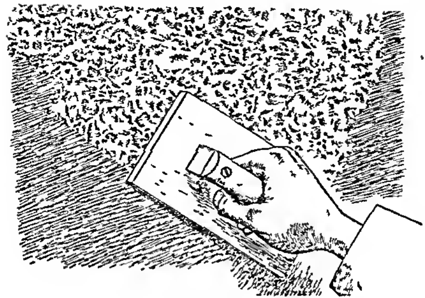
Any of the textures just mentioned may be left in the formation made by the tool used or, while the surface is still wet, the flexible

Fig 40. Sponge texturing can be very effective

piece of celluloid may be dragged over it as already described If the formation has been *left without dragging*, it is advisable when the plastic is dry to go over the surface with coarse sandpaper laid over a flat block. This will remove any sharp points without materially altering the form of the design

Fig 41 Using a variety of tools to produce interesting and more decisive patterns. (Top) palette knife, (centre) broad scraper (bottom) trowel

A smoothly mixed plastic evenly distributed over the surface is essential to the successful use of combs Any lumps destroy the design and uneven distribution causes irregular formations of deep and shallow lines It cannot be too strongly emphasised that any fault of this kind will render even distribution of the glaze colour difficult, if not impossible The comb produces more definite results than those already mentioned and before commencing to use it the operative



USING THE HAND BOARD

Fig 42. It is pressed flat against the wet plaster and then pulled sharply away

must have a very clear idea of the designs he intends to execute

Combed textures may be employed, in conjunction with those obtained with other tools, to produce panels or decorative lines and forms, apart from their use in the production of all-over patterns (Fig 45) When using combs, a damp sponge should be held in

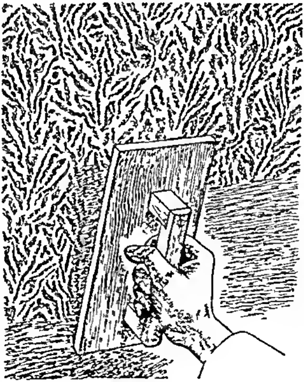
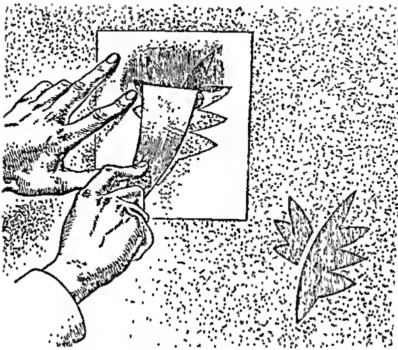


Fig 43 A different tree-like formation is produced when one end of the hand board is lifted before the other.



RAISED ORNAMENT

Fig. 46. Units of relief pattern applied in plastic through a stencil of thin ply-board.

of glazes or scumbles may be purchased ready for use except for the addition of thinners. If the area to be glazed is large, a proportion of linseed oil may be added to retard the drying; otherwise turpentine or white spirit is used.

Using Glazes

The glazes are obtainable either in a range of colours or transparent. The latter form is preferable and is the more economical. It may be tinted with oil colours as required and, as the amount of colour needed is relatively small, tube colours can be used with advantage. Glazes made by the painter contain raw linseed oil, liquid oil driers, and white spirit. A proportion of flat varnish is useful for setting the glaze and reducing gloss.

Water glazes may be used instead of oil. Dry colours, or colours ground in water, are bound either with gum arabic or with glue size. The petrifying liquid used for water paints will answer the same purpose.

A tonal effect requires two mixings of glaze, one light and the other darker. The light tone is brushed or scumbled evenly over a portion of the surface. The darker colour is then dabbed irregularly over it with a large fitch, these dabs being broken up until they blend into the lighter tone. The blending may be done with the bristle stippler, a rubber stippler or, better

still, with an open-weave dish-cloth

Multi coloured effects of two or more colours may be carried out in a similar way A quantity of the predominating colour is made up and smaller quantities of the other colours are prepared

The effect of relief may be emphasised by taking out the high lights with a flat rubber squeegee As the squeegee is taken over the surface it removes the glaze from the prominent parts, exposing the ground colour It should be wiped free from the accumulation of glaze after every stoke, otherwise the glaze will be pushed on one side, causing a dark thick edge against the high light Use of the rubber produces a hard effect To obtain a softer effect the rubber may be covered with soft absorbent rag or the rag itself may be made into a pad

Varnishing of the work will assist in protecting the glaze and give it additional wearing properties, but usually this is unnecesssry as the glaze alone will stand up to reasonable wear The gloss of the varnish detracts from the decorative value and its use is not recommended

Among other methods of decoration, the groundcoat may be finished in varnish colour or in a gloss paint Instead of glaze, a flat oil paint, deeper in tone than the ground, is used for scumbling The high-lights are wiped off with a rag leaving the deeper flat tone in the background If stencilled patterns have been applied in relief they may receive a different tone or colour of groundwork from the texture Either glaze or flat colours may be applied and wiped off as previously described

Bronze paint may be applied to the high-lights by rolling the rubber squeegee first in the bronze paint, which is spread on a slab or flat board, and then over the textured surface

Oil bound plastics are composed of varnish, gelatin solution, and pigment, with the addition of sand to provide a coarse texture The gelatin solution acts as a stabiliser and holds the sand in suspension This group contains those preparations made up in order to represent stone effects in paint They are applied over a groundcoat of paint, and are themselves finishing materials requiring no further treatment after texturing

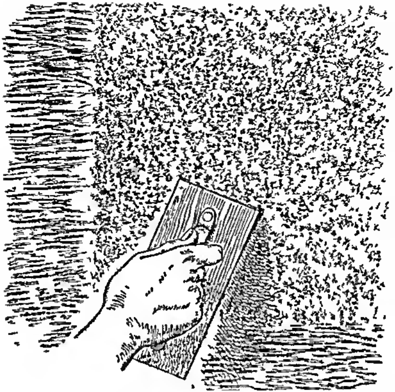
Other members of this group are of finer composition and may be worked into low relief patterns When the plastic is hard it is polished with rag or brushes to develop a gloss

Resin Finishes

Resins may be divided into three groups natural, ester, and synthetic

Natural resins, being variable in hardness and other qualities which affect their action, made varnish manufacture years ago something of an art rather than a science, much depended upon the observations of the man on the spot while the varnish was being made Although there were limits to the degree of variability, there was always that small amount which gave rise to some speculation in the mind of the user every time a new gallon of varnish was opened It was a craftsman s material for the use of a craftsman, it produced, and still produces, many a fine and lasting job, despite its humours and waywardness

The esters or modified resins



BRISTLE STIPPLING

Fig 44. Producing a texture by employ ng the bristle stippler

the left hand so that the teeth may be wiped clean of material after every few strokes

Preparing Stencils

Stencils may be cut out of material such as stiff paper, card board, or ply board The design should be bold and free from intricate detail The ties when these are used must be generous in width in order to take the strain of the heavy plastic. After being cut, the stencils should be well knotted to prevent absorption of water The all-over texture should be allowed to set before work is commenced with the stencils The operative should then place the stencil in position take up the plastic with a broad knife and fill in the cut-out to a level surface (Fig 46) The stencil must be lifted directly away from the surface, avoiding sideways motion which would damage the shape If ragged edges are left they may be smoothed off by a wet fitch when the plastic is partially set.

Free decorative ornament may be carried out by applying the plastic either with a trowel or with a broad chisel and palette knives The design is formed with these aided by large modelling tools or

with various sizes of fitches Small combs may also be used where raised lines are required The whole of the surface may be plastic and the designs completed in one operation, except that it is sometimes advisable to apply a thin coat of the plastic and allow it to dry before the heavier coating is put on

For either stencilling or free ornament work the operative should have been trained in the principles of design, otherwise it is advisable for him to keep to the simpler all over textures

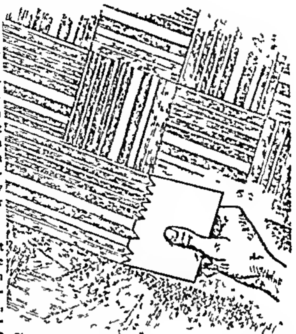


Fig 45. Using the celluloid comb to make distinctive patterns, the comb being wiped after each unit is put in

Jointing blocks representing marble formations (see Fig 36) When the texture of the desired "marble" has been obtained the plastic should be allowed to set hard enough to bear the weight of the straight edge without leaving an impression Tools for marking out the jointing may be made from the handles of old tooth-brushes These are hard enough to cut back the partially set plastic and will leave a smooth clean line The position of the joints should be struck out with charcoal on a chalk-line the straight edge placed in position and the lines taken out with the tool held firmly The straight edge must be wiped with a damp sponge to remove any bits which may have adhered to the end Vertical lines are taken out first, the horizontal lines will cut across the ends of them so as to form a clean break The whole operation must be cleanly done without leaving any ragged edges; if these lines are later picked out in a separate colour, any unevenness will affect the successful running of the lining fitch

Finishes When the plastic has dried out, suction must be stopped before any finishes can be carried out This is effected by the application of one or more coats of oil paint One coat may suffice, but it is advisable to add another This obviates any sinking in of the glaze owing to parts being missed or only thinly coated which would result in dark, unsightly patches These groundcoats may be white or tinted in harmony with the colour of the finish A metallic effect may call for a coat of bronze paint

Oil Glaze Proprietary b...

combine the natural and the synthetic The natural resins and rosin are broken down by various agents and reconstituted as esterified resins They are sometimes loosely classed as synthetics, and are more water resistant than the natural resins They are largely used in general-purpose varnish, and combined with China wood oil make durable varnishes and enamels

Laboratory Products

Synthetic resins resemble natural resins in their properties but are made entirely from inorganic or organic materials or both, without the incorporation of natural resin They are products of the laboratory where composition is controlled, eliminating the degree of variability which the natural resins possess

The two main types of synthetic resins are the glyptals combinations of glycerine and phthalic acid with a drying oil, and the phenolic, composed of phenol and formaldehyde

The glyptals are used in pale air-drying varnishes in gloss semi-gloss, and flat enamel and in flexible machinery finishes The phenolics are employed for waterproof varnishes and enamels and for sea water resistant and alkali proof finishes The glyptals do not affect the colour of enamels nor darken to any appreciable extent on exposure They combine decorative quality with good resistance to wear and to atmospheric influences The phenolics darken considerably on exposure so their decorative use is confined to dark colours and their main function is one of protection in industrial finishes

The composition of synthetic finishes depends not, as in oil varnishes, upon the amount of oil used, but on the plasticising of the resin with a relatively small amount of oil The behaviour of a resin must always be considered in conjunction with that of the drying oil Tung oil, dehydrated castor oil, linseed oil, and perilla oil may be used either raw, heat treated, or blown Thinners such as naphtha and pine oil have a solvent action

The chief characteristics of synthetic finishes are easy application free working under the brush, and flowing out with a freedom from brushmarks and ropiness Less crossing and recrossing is required than is necessary with an oil varnish The covering capacity is from eight to ninety square yards per gallon

They have a distinctive gloss which may not initially be as high as that of an oil varnish or enamel, but is retained for a longer period They dry in from four to eight hours The final hardening off is rapid differing fundamentally from the long period of tackiness and oxidation of oil paints The film is hard tough impervious, and flexible not chipping nor being affected by oil or petrol and is less liable to blister than that of the more elastic oil paints

Preparing the Surface

The surface whether of wood metal, plaster, or some other substance should be prepared as for oil painting except that even greater care is necessary to see that there is no grease nor any coat of paint which is not firmly attached It is often difficult to say whether the old paint is sufficiently attached to withstand the pull of the hard tough coat of synthetic, when trouble occurs a fault which really

lies in the old painted surface may be blamed on to the last applied material

The following two instances illustrate the importance of this point

The front woodwork of a house facing west and situated in the country was painted partially with synthetic enamel, strictly according to the manufacturers' directions, and partially in the traditional method of undercoats and varnish The preparation was identical in each case, the previous paintwork, which was in good condition, was surfaced down with pumice stone and water Within three months the synthetic peeled bringing the rubbed-down undercoatings clean away down to the bare wood while the painted and varnished surface remained intact

Fault Repeated

The same fault occurred in the second instance, where steam pipes and the wall behind them were finished in a well known brand of synthetic enamel The steam pipes peeled to such an extent that it was only necessary to use a dusting brush to remove the entire coating together with the foundry priming paint The wall surface behind it remained intact

In each instance the work was re-executed with synthetic after all paint had been removed from the surface, in neither case was there recurrence of the fault

The undercoats for a synthetic finish must be of synthetic composition and not on a linseed oil basis This aspect of groundwork has been stressed, because the preparation and undercoats are at fault more often than the finish so that it always pays to take every possible precaution against these faults Linseed oil should never be added to synthetic finishes or undercoats

If additional thinning is required, it is always wise to use the special thinners supplied with the particular brand of synthetic used Failing this, a small amount of American turpentine may be added, but not turpentine substitute The thinners used have a solvent action which will slightly re-soften the surface of the previous coat applied This solvent action renders feasible a practice which is not possible with oil varnishes or enamels, that is, the application of a synthetic over the hard glossy surface of a previous coat without any preliminary flatting down Any alterations in the colour of enamels should be made either with the special stainers supplied by the manufacturer or with colours ground in turps Colours ground in oil should not be used

Here is a specification for new work

After the usual preparation and knotting (1) coat with synthetic primer, (2) apply coat of filler, stop and face up, apply second coat of primer thinned down, (3) apply undercoat (4) apply two coats of gloss finish the first one being thinned down or prime fill, and stop up Face down and apply two coats of finish the first one being thinned down

For flat or semi flat finishes the procedure follows the same general lines the flat or semi flat finish being thinned down *for the first* coat

Old painted work if in good condition may be faced down stopped up and completed with two coats of the finishing material as before.

CHAPTER IX

CELLULOSE AND SPRAY PAINTING

USES OF CELLULOSE. COMPARISON WITH OTHER MATERIALS CELLULOSE LACQUER AND ENAMEL COMPOSITION APPLICATION OF CELLULOSE. LACQUERING FLATTING AND FINISHING PREPARATION OF SURFACES FOR RE-CELLULOSING, SPECIAL FINISHES SPRAY PAINTING SPRAY PLANT SPRAY GUN, USING AND CLEANING THE GUN DECORATIVE SPRAY WORK ENAMELS

Up to the present, painters and decorators have not made very great use of cellulose A large proportion of the cellulose manufactured has been applied by people unacquainted with the technique of oil painting These people have had nothing to forget and have been able to approach the subject with an open mind The painter, on the other hand, has tried to apply to cellulose the principles he has found successful in more familiar media He should adapt his principles to cellulose and not try to apply cellulose as his previous experience might dictate

Valuable Qualities

Cellulose enamel and lacquer have passed from the experimental stage and become really sound and valuable commodities Their qualities of quick drying and resistance to hard wear can solve many difficult problems

Comparisons between oil paint and varnish on the one hand and cellulose lacquer and enamel on the other, will prove *of practical* value to the painter They may be summarised as follows

Composition (*a*) Paint pigment, drying oil, drying medium, thinner. Varnish resin, drying oil, drying medium, thinner (*b*) Lacquer nitrocellulose, resin, solvent, diluent, plasticiser Enamel add pigment to the above

Drying action (*a*) The drying medium (paste or liquid driers, terebine, gold-size, etc.) acts upon and oxidises the oil, turning it from a liquid into a solid, at the same time, the thinner slowly evaporates from the film of paint. Drying time is a period of hours When dry, the film cannot be re-softened by ingredients of the paint, therefore, there is no disturbance of the first coat of paint when another is applied (*b*) The film dries by evaporation of the solvent and diluent, leaving the nitrocellulose, resin, and plasticiser as a hard durable film It will be noted that there is no drying agent, in fact, the plasticiser might be termed a retarder Drying time is a period of minutes The solvents will re-soften a dried film.

Availability (*a*) In a broad sense every craftsman knows the composition of, and can make up, *paint to suit his own purpose* The materials are easily obtained and allow considerable latitude (*b*) Manufacture is controlled by the chemist and the composition varies with the purpose The formula

adopted by one manufacturer usually differs from that of another, and it must not be assumed that the cellulose enamel or lacquer made for any particular purpose will mix with another make designed for the same purpose The same applies to thinners, there is no universal thinner to perform the same function that turpentine does for paint, and the user must employ the one specified and supplied by the manufacturer

Application (*a*) About 95 per cent is applied by brush (*b*) About 95 per cent is applied by spray.

Advantage of Spray

A second coat of cellulose will re soften the previous one, but application by the spray avoids the friction of the brush method with its liability to work up the previous coat Brushing cellulose is on the market as a practical proposition and, although its use is small compared with that of spraying cellulose, it can be very useful to the painter when transport of spray plant would be uneconomical

Durability (*a*) An oil paint becomes harder and less elastic with every day that passes until ultimately the film of paint breaks down Five years is a reasonable life for paint used on exteriors During that period it is liable to suffer damage from abrasions and climatic conditions owing to the elasticity which is designed to lengthen its life During its first three years or so it will contract and expand with the movement of the surface on which it is applied This is a valuable property, especially on wood surfaces, which it will penetrate sufficiently for perfect adhesion (*b*) Cellulose is hard from the time it dries The film formed is tough and will withstand the action of petrol, oil, acid, tar, and a considerable amount of abrasion It should not, of itself, crack or chip, but when applied over surfaces which are liable to contract and expand, and into which it does not penetrate, it cannot withstand the pull to the same extent as paint

Odour (*a*) The characteristic smell of paint has become familiar by long usage and its lingering for days has been accepted by most people as a part of the price they have to pay for re-decoration (*b*) Cellulose has a very strong and penetrating odour, so different from paint that considerable objection is sometimes raised against its use in domestic work Yet, once the work is dry, the highly volatile media soon dissipate and there is no lingering smell

The initial cost of cellulose is higher than that of an oil paint, but there are other considerations which affect the comparative costs A good deal of paint is lost by skinning, either in storage or on a tin allowed to stand about even for a few hours Material and often time are lost in subsequent straining There is also loss by "fattening" of the mixed paint

Speedy Application

Cellulose does not skin, although it loses some of its highly volatile thinners or diluents The time element is an important factor in the total cost of the job Work which may take several days with an oil paint, each coat of which is allowed not less than twenty four hours to dry, may be finished in one day with cellulose The importance of this cannot be over-estimated where painting might cause

interruption or inconvenience in some business or public place

Before proceeding further, the craftsman needs a working knowledge of the general composition of lacquers This can be summarised briefly as follows

Nitrocellulose, the chief ingredient, imparts durability and resistance to abrasion Resins (gums) provide adhesion, body, and gloss Solvents break down the cellulose and resins Diluents thin down the composition and lower costs. *Plasticisers counteract brittleness*

Dyes may be added to obtain coloured lacquers

Pigments are added to the clear lacquers to make cellulose enamel Pigments are chosen which will not react chemically with the ingredients in the lacquer, earth colours are largely used on this account Lake colours also find favour with the manufacturer

Fine grinding of the pigments is essential Intermediate tints may be made by inter-mixing the standard coloured enamels of any one manufacturer

A brief note on some of the resins used in cellulose preparations will indicate that the universal use of any one type of lacquer or enamel cannot be recommended

Use of Phenols

Phenols offer good resistance to alkalis, damp and moisture They are incorporated in ground coats for plaster and in finishes where water resistance is the chief consideration They darken considerably on exposure to light and are, therefore, unsuitable for pale or decorative finishes

Glyptals are used in finishes They are light and stable and do not affect the colour of the finished surface to any marked extent. Therefore, a ground coat for plaster walls may contain the phenol type of resin, while in the finish glyptal resin may be employed

Coumarones increase the durability and adhesion of the film They are subject to only slight oxidation and are, therefore, especially valuable ingredients in media for bronze paints They have a tendency to yellow on exposure, and cannot be used for white or light tinted enamels

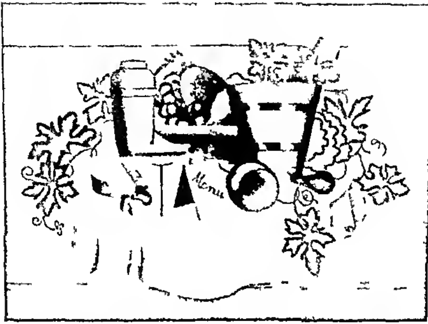
Cleanliness Essential

Before applying cellulose, the grounds must be free from moisture, grease, or any other foreign matter which would prevent adhesion Although these considerations apply also to an oil paint, and the painter is familiar with the processes of preparation for painting, a still greater degree of cleanliness is required for grounds on which cellulose is to be applied, for cellulose is more susceptible to moisture and grease Its hardness demands perfect adhesion to prevent peeling of the film

The use of unseasoned woods must be avoided, and any surfaces which have become moist must be dried out before the work proceeds The same applies to subsequent coats which have been rubbed down in water, filler coats tend to absorb a certain amount of water and sufficient time must be allowed for this to dry out

For the removal of grease the manufacturer supplies a cleaning solution, for the cellulose, thinner may be used Apply the solution with a pad of clean rag, commencing on the mouldings or in the corners and finishing on the flat portions A warm temperature or,

PLATE V



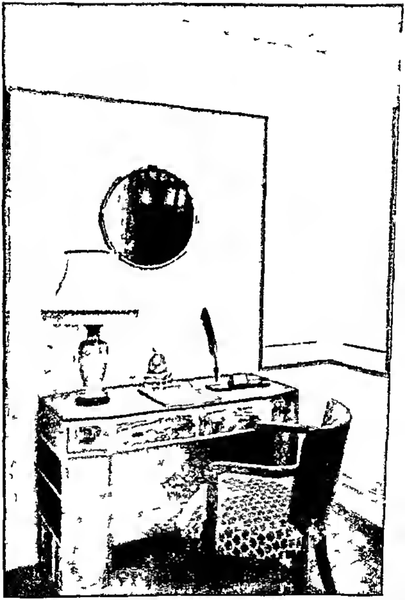
MODERN SPRAYED PANEL WORK

Executed by the designer Peter Utley for the decoration of a dining room this design introduces stencils templates free spray line and pencil work The ground is pale greyish blue green and the design in variations of greens blues and greys

MURAL PERIOD DECORATION

This is a very fine example of the high degree of decorative quality which can be attained in flat oil paints by combining spray and line work We are indebted to the designer Stanley A Hickson for permission to reproduce it

PLATE VI



WALL PAPER FOR A WRITING ROOM

Plain textured paper covers the ceiling and frieze and forms the panels on the wall in this Sanderson design A patterned paper covers remainder of the wall surface and an effective div sion between the two is obtained by use of a suitable moulding

if possible, warming of the surface will facilitate this operation by softening the grease

Ventilation is essential when applying cellulose The fumes of the highly volatile solvents and thinners, if allowed to hang about, are a source of danger to the health of the operative, and as they are also inflammable there is great risk of fire In workshops where the article is conveyed to the spraying plant there are stringent regulations governing the use of cellulose materials, and it is necessary for the operative to become completely familiar with them before using or setting up such a plant

Introducing Ventilation

The painter and decorator must often use a portable plant or even apply the cellulose by brush on the job He is then compelled to improvise a system of ventilation A portable electric fan may be temporarily hung in a door or window to extract the fumes, but often ventilation may be secured simply by opening windows

Draughts and humid atmospheres must be avoided or the material will be chilled and turned white Some of the thinners used have a toxic effect upon the operative, and the wearing of a mask to cover the nose and mouth is advisable, especially when the ventilation system is not very efficient Tins of cellulose in use should not be allowed to stand about open The cap or lid should be replaced after the spray gun has been charged, or, in brushing processes, when the working kettle has been supplied Failure to do this leads to loss of thinners by evaporation and a danger of foreign matter making it necessary to strain the cellulose

It is not possible for brushes used in cellulose to be placed in any medium to keep them usable for further operations, and at the end of every day they must be washed out in cleaning solution For shorter periods, such as breaks for meals, they may be placed in some of the material The container should be fitted with a cover to enclose both material and brush

The care of the spray gun will be dealt with in detail later, but it cannot be too often repeated that for short breaks of an hour or so the material should be poured from the cup and replaced by a small quantity of thinner, some of which should be allowed to run through the nozzle

Cellulose lacquer has replaced french polish in a large proportion of the natural wood finishes on furniture and interior woodwork. It makes a more permanent film, withstands rough usage better, and affords greater protection against heat and stains from spirits and acids

It also allows a more extended range of finishes, including high-class finish comparable with the best french polishing, a levelling finish superior to brush polishing, a natural finish, in which the object is to retain the natural colour of the wood without undue yellowing, matt or semi-matt finishes, imparting a satiny sheen, and semi-pigmented finishes, as in weathered or limed oak

Spirit or water stains may be used for staining where a high-class finish is required

Spirit stains should be generously applied with the largest practicable brush Care must be taken not to have the stain too dark. It is possible to darken a too-light

tone by a second application, which also results in more even distribution and less danger of patchy effects

Water stains may be applied with a brush, but when the work is dry it should be lightly sandpapered, as there is a tendency for the water to raise the grain of the wood

All manufacturers supply fillers to correspond with the colour of the wood being finished and they are satisfactory in use A filler may be made by mixing an appropriately coloured pigment with a proportion of the lacquer

Using Filler

There are two methods of application In the first, the operator thins the filler down and applies it with a brush, working well into the grain It is left for about fifteen minutes while it partly sets and then, by means of a pad of coarse hessian cloth, is worked across the grain, leaving the surface clear and the pores filled up

Alternatively, the filler is applied by a cloth pad without thinning and rubbed into the pores, finishing the operation in the same way as above Several hours should be allowed for it to dry

Clear cellulose lacquer is employed for lacquering Two coats are applied with the spray, allowing from a half to one hour between coats, the method of application being as outlined later in this chapter

It will be noted that after the first coat of lacquer has been applied to some woods, the tone effect is uneven owing to some portion of the wood being too light If this is so, some of the lacquer should be tinted with appropriately coloured spirit stain and locally "faulted up" For this purpose the spray from the gun should be cut down to a fine jet Half an hour should be allowed for drying before applying the next coat of lacquer; after which two hours or more are allowed before the next process

The coats of cellulose which have been applied are mere films, much thinner than coats of varnish applied with a brush The cellulose shrinks down to the surface, leaving the filled pores slightly recessed To rub down the surface in order to level up, as may be done with varnish, is not always possible, and a *levelling process is employed* which partially softens the coatings Manufacturers supply levelling or pull-over solution for this purpose

A pad of soft cloth or cotton wool covered with chamois leather is well moistened with the solution and passed over the surface with *light circular movements*. These are finally finished off in the direction of the grain On some woods of close grain the levelling can be omitted and flatting can immediately follow the lacquer coats

Method of Flatting

Flatting may be carried out about two hours after the former process

The materials used are Nos 320 or 400 waterproof abrasive paper and water If clogging is experienced, soap may be used as a lubricant.

The paper is allowed to stand in water for some time before it is used, this makes it more pliable, obviates breakage through brittleness and renders the working face smoother Mouldings should be rubbed down first, together with a narrow portion of the panel close

to the mouldings For rubbing the panels, the paper should be used on a flat block of wood, felt, or rubber and with sufficient water to keep it lubricated Rubbing down should be done with light circular movements The work should be left to stand over-night before proceeding

For finishing, the materials required will be burnishing paste, and paste or liquid polish Moisten a soft rag with white spirit, take up a small quantity of the paste and rub with medium pressure in one direction only This will leave the surface with a matt finish which can be developed with the polish into a full gloss Rub in a small portion of the work at a time with the polish on a soft rag and finish with a clean, soft, dry cloth

Another Finish

As an alternative finish, cellulose is very adaptable to french-polishing methods The material may be applied either by spray or by brush and bodied up by the pad or rubber

After the lacquer coats have been applied and left for several hours to harden, the work is lightly flatted Polishing lacquer (1 part) is mixed with thinners (2 parts) and applied by a pad This is worked over the surface in the same way as french polish and allowed to stand over-night The work is finished by using solution (1 part), thinners (2 parts), and white oil as a lubricant on the rubber

Levelling finish ("*pull over*") For woods such as mahogany and walnut, requiring an unbroken gloss surface the operation stops at the levelling stage previously described It is satisfactory for medium class finishes Oak looks more natural if the grain is not filled up Only two coats of lacquer are required, followed by a "pull-over"

Natural finish A grain sealer is supplied which is sprayed on to the surface This, when dry, can be lightly rubbed down with either 320 abrasive paper or fine steel wool and finished as described in previous processes If less gloss is desired the work may be matted

Matt or satin finishes Special matt or satin lacquers are supplied which when sprayed over the faced-down grain sealer, need no further treatment They flow out to a fine, even surface For woods such as mahogany and walnut, flatting by the use of abrasives over the gloss lacquer gives a more high-class finish

The sequence of operations is as follows grain sealer, face down dry, lacquer coat, rub down wet, lacquer coat, matt down with special abrasive powders or fine abrasive paper and water

Semi pigmented finishes Apply one coat of sealer, rub into the grain a coloured or metallic filler, according to the effect required, and finish matt or glossy as desired The filler may be a flat oil paint used stiff

Pigment or enamel finishes The ground on which the enamel is to be used may be either new wood, metal plaster, or previously painted or cellulosed surfaces

For new wood the sequence of operation is primer, filler coats (rubbed down), sealer primer, enamel, either flat down and polish or use a levelling solution, or flat down and apply a solution of clear lacquer, pigmented lacquer, and thinners

Priming may be either an oil or

synthetic primer Application with the brush is recommended The spray applies a material to the surface, the friction of a brush works the material into, or fastens it more securely on to, the surface, providing better adhesion and minimising the danger of peeling

Filling may be either a paste made from a flat oil paint thickened with good quality whiting and slate powder, and applied in one coat with a filling knife; or several coats of synthetic filler applied by spray, or five or six coats of cellulose filler applied by spray The first two would be rubbed down in the way outlined previously and sprayed with cellulose sealer primer

When the cellulose primer has dried it must be faced down with *320 abrasive paper and water If* cellulose filler is used, a cellulose primer is applied direct to the new surface and then, finally, the enamel coats follow the filler after surfacing has been completed

Putting on Enamel

For the enamel coats, the first coat is applied by spray and left for thirty minutes to dry, then a second coat is added and allowed to stand overnight

Flatting down is done wet with 320 paper, and if, as sometimes occurs, places have been rubbed bare or the ground coat shows through, a fine jet is used to spray enamel on to these places only When dry, burnishing paste is used to polish as described *for* wood finishes

Two alternatives must be mentioned for the above procedures A levelling solution may be used, followed by burnishing and polishing Secondly, after flatting down the second coat of enamel, one coat may be applied which consists of 3 parts clear lacquer, 1 part enamel, and 1 *part thinners*

Previously painted or cellulosed surfaces The procedure varies only in the preparation necessary on such surfaces to render them suitable for cellulose application The condition of the surface may be such as to require removal of the existing material When this has been done it should be treated as a new surface

Sealing Coat

Oil paints may be re-softened by the action of the diluents in cellulose Tests may be made by applying a coat of cellulose on some portion of the work to see if this condition is likely to arise If so, a *sealing or buffer coat must* be applied, manufacturers make special sealers for this purpose Alternatively, a coat of either size or spirit varnish may be used. If necessary, a filler can be sprayed over this or the enamel coats can be sprayed directly on to the sealer

Bronzing Bronze or brass articles or fittings may be sprayed with a transparent lacquer or, if desired, the lacquer may be tinted with dyes or stains to produce tonal effects. The lacquer protects these metals from tarnish, obviates laborious cleaning, and is of particular use on fittings, such as door furniture, which are constantly handled

To produce bronze effects on metals other than the above, they may be sprayed with a cellulose lacquer in which is incorporated a suitable aluminium or bronze powder as a base for the effect it is desired to obtain The powder should be wetted with the thinning medium before being added to the

cellulose This metallic coating can be either left as a finish or sprayed with a tinted lacquer

Lustre effects can be obtained by adding metallic powder to a pigmented lacquer of a selected colour, to which has been added a proportion of clear lacquer to reduce opacity.

Cellulose over distemper and tempera Small articles, movable furniture, or wall surfaces may be decorated in distemper and protected by one or two coats of clear lacquer without any risk of striking or darkening, such as would occur if an oil varnish were used Such surfaces will stand a reasonable amount of wear and are washable This is a relatively cheap method and is quicker than decorating in an oil paint, while the gloss may be regulated to the exact degree required

Decorating with cellulose on cellulose The rapid drying and re-softening of previous coats often make this an extremely difficult problem, but experiments in the method will disclose ways and means of overcoming these disadvantages, or even of adapting them to a particular purpose The simplest way is to use masking tape, masks, stencils, or media which prevent the cellulose from adhering to such protected places

Method of Lining

Lining can be done with the aid of masking tape, the enamel being sprayed between two lines of the tape Alternatively, special lining cellulose can be obtained which can be used in the lining fitch in the usual way To hold stencils to the surface, a special adhesive is used which permits them to be removed and used again and again without injury to either surface or stencil.

Several important points should always be observed by the operator. For example, filling is not required for every job and, on many, two coats of either lacquer or enamel will be deemed satisfactory On the other hand, coatings of cellulose are so much thinner than a corresponding number of oil-paint coats that irregularities of surface sometimes show plainly.

Less Opacity

A cellulose enamel will not carry the same amount of pigment as an oil enamel, therefore its opacity or obliterating power is less An excess of pigment leads to loss of gloss and breaking down or chalking of the film of cellulose.

Cellulose and bronze powder must be mixed just before it is to be used

Light will affect the wearing qualities of a clear cellulose coating, therefore, on exteriors a pigmented lacquer will last longer, as the pigment protects the cellulose structure from the light rays

Cellulose will stand extremes of temperature well, and is, therefore, suitable for finishing articles subjected to either heat or cold, as, for example, table surfaces and refrigerators

The introduction of sheet metal, of laminated or ply-board, and of hard plaster surfaces, cellulose, and spray plant, all fairly recent inventions, have coincided to make each of particular service to the other

The spray plant may be either of the compressor type, ranging from hand portable machines of only one gun capacity to fixed units capable of supplying air to a battery of guns, or of the direct pressure

type, whose working principle is similar to that of the barrel shaped electric sweeper

When a painter and decorator is considering the purchase of a spray plant there are many points to be taken into consideration He should remember that many such plants are not specially designed for his purpose and that some have features which render them unsuitable The plant should be portable but of sufficient capacity to carry out any job he is likely to undertake The compressor chamber should be large enough to maintain a regular pressure while the gun is being used The plant may be driven by petrol or by electricity If there is not sufficient work for two spray plants, one of each kind, the intending purchaser should consider whether work is likely to arise for which electric current will not be available If the choice is an open one, the electric drive, being free from fumes and less noisy, is to be preferred

Feeding Spray Gun

The spray gun may be either gravity- or pressure fed The first system entails the medium being held above the gun in a cup or independent container with a loose covering, while the pressure-fed supply is sealed and may be in any convenient position

A gravity feed is excellent for many operations It is the lighter in use and requires less power to maintain a constant stream from the nozzle On the other hand, it can be an abomination to the painter and decorator He must take his spray gun to the job, he cannot always move the surface to be sprayed and, sooner or later, will find himself faced with the necessity of spraying a ceiling or other underside surface With an overhead cup of the design fitted to most gravity-fed guns he may end by pouring the paint out of the lip of the cup

Another advantage of the pressure gun is that it enables the colour to be quickly changed A container can be used for each colour, and all that is required is that one container be detached and another fitted A few preliminary bursts with the gun will clear it of the previous colour On the other hand, in like circumstances the gravity fed gun requires the emptying and cleaning of the cup for each successive colour

Operating Instructions

Directions for using any particular type of spray gun are always supplied by the maker and it is unnecessary here to refer to the working of any one type

Passing through the gun is a forced stream of air which comes into contact with a stream of fluid at the nozzle This fluid is atomised and distributed, if the air and fluid adjustments are correct, on the surface in a form controlled by the nozzle Nozzles are usually either fan shaped, in which case they spread the material in broad strips varying in width and density with the distance the gun is held from the work or round, producing a more concentrated and circular jet of atomised material In addition, there are nozzles for special purposes, such as those used for spraying plastics and fillings

Air pressure may range from 30 to 70 lb for viscous material while 10 to 20 lb is sufficient for stains dyes, water colour, and other thin-bodied materials

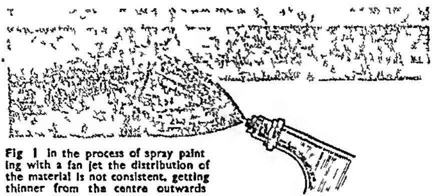


Fig 1 In the process of spray paint ing with a fan jet the distribution of the material is not consistent, getting thinner from the centre outwards

Always use the lowest pressure which will produce the degree of atomisation required If the pres sure is too high several faults are likely to occur

The material may rebound from the surface causing wastage by creation of vapour and impreg nating the air breathed by the operator and anyone else in the vicinity

It is difficult to place the material evenly into corners and inter sections of buildings and similar projections

The material is chilled before it reaches the surface The operator can confirm this statement by pour ing boiling water into the cup and holding his hand in the spray when the trigger is pulled back The vapour emerging from the gun will be quite cool As a consequence with highly volatile materials like cellulose partial setting of the lacquer may occur before it reaches the surface so that it cannot flow out properly and the surface is marred

The flow or pressure of the material through the gun can be varied by opening or closing the needle adjustment

To use the gun the air release must be adjusted so as to open slightly in advance of the material If this is not done blobs of material will appear on the surface owing to accumulation of the material at the nozzle before air power is generated The distance the nozzle is held from the surface may vary from 6 to 10 in according to circumstances Once a distance is decided upon as being satisfactory it must be maintained, otherwise there will be uneven distribution

Mouldings corners and similar details should be sprayed first It is difficult to touch up misses in these after the flats are finished This is noticeable when coloured lacquers or stains are being sprayed

Even Strokes

When spraying flat surfaces the strokes must be evenly made The gun must never be waved about in an indeterminate manner The operator should work from the near edge across the section of work to be covered and release the trigger at the completion of the stroke He should never hold the trigger back and try to work back ward and forward without releas ing it as this builds up a heavy coat at every turn He should avoid blowing over previously coated

work whenever possible, and so must have his gun slightly pointing away from the preceding stroke or previously sprayed surface

The application of material is not constant throughout the width of the stream For example, when a fan jet is used the centre is fully coated, while along both edges the application is thinner, so that every stroke must overlap the preceding one (Fig 1)

It is important before commencing to work to see that all dust is removed from the vicinity The surface to be sprayed, especially if irregular or of *relief ornament*, may be dusted by blowing a current of air through the gun.

Cleaning the Gun

To clean the gun, the material is poured out and, when the container or cup has been cleaned out with a brush or rag is replaced

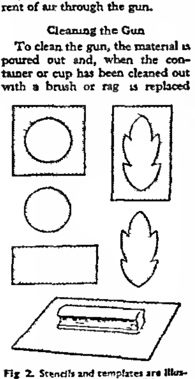


Fig 2. Stencils and templates are illustrated In bottom sketch will be seen a hand-hold fixed to back of a template.

with some of the thinners If a rag is held in front of the nozzle, the liquid will be forced back into the container, bringing with it any bits of material which have been too large to pass the nozzle. The nozzle fittings must then be removed and care taken to see that the air apertures are clean Material must never be allowed to remain in the gun until it wholly or even partially sets Good work depends upon a smooth flow of material, and if, through neglect, the gun has to have the paint scraped from it or removed by solvents, its efficiency is impaired it should on no account be cleaned out with caustics, which attack the metal

Manufacturers advertise their guns as capable of spraying a varied assortment of materials and it is surprising considering the delicacy of these instruments, how many materials they will take and what rough usage they will stand Nevertheless, a gun which is used for only one type of material will perform its functions more effectively than one in which the material is varied from day to day

Requires Dismantling

In the latter case, cleaning is much more difficult and the gun requires dismantling more frequently This is especially so when a water paint has been used after an oil paint or cellulose, obviously it is better to have a separate gun for water paints and distempers Oil and water paints and similar materials should always be strained before use as this not only removes bits from the material but also gives it a more even consistency than can be obtained by stirring

The spray gun can perform many of the decorative operations

previously carried out with brushes and other tools In addition, it possesses characteristic decorative possibilities which have not yet been fully exploited The effects which can be produced may be divided broadly into the following groups: (*a*) Shading, blending, and so forth, (*b*) stencilling and masking; (*c*) spray and line, including sprayed murals

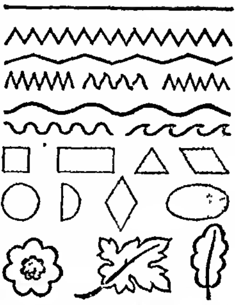


Fig. 3 Showing basic line and form and the first elementary development of design

Shading and Blending

Group (*a*) includes those operations which were carried out by the stippler before the advent of the spray In a room where the walls are to be graduated from one colour at the top through several changes in tone and hue to another at the bottom, each band of colour may be sprayed all round the room before proceeding with the next There is not the same necessity as in stippling for keeping edges alive or wet, the second colour is effectively blended into the first and any faults are more easily touched up

The gun should be held at the maximum working distance when subtle blends are desired and nearer for greater contrast between two adjoining colours

When the technique of the gun has been mastered, these effects follow as a matter of course from practice and the correct handling of the instrument

Stencilling and Masking

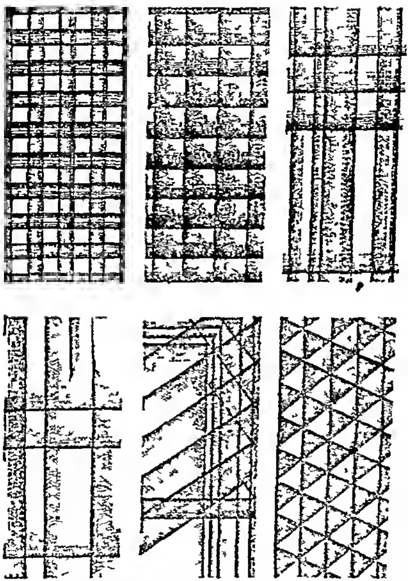
In group (*b*) the gun has not only eliminated a great deal of the laborious work of the stencil brush, but has also reduced much of the finicky detail of the stencil plate.

The materials used for stencils and templates are of an absorbent, semi-rigid nature, which cut fairly easily, strawboard and thin plywood are good examples (Fig 2) Paper, as generally used for stencils is liable to blow away from the surface during spraying and allow colour to extend beneath the edges, thus spoiling the clean-cut appearance of the pattern

Fixing Hand-hold

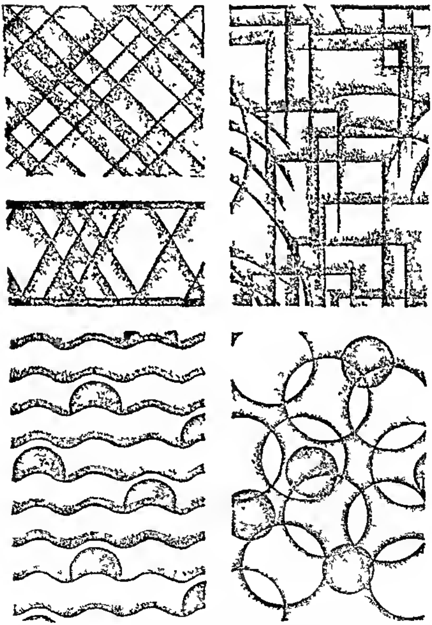
When a template is used, a hand-hold, consisting of a small piece of wood, should be fixed to the back to facilitate handling When spraying, the gun is held fairly near to the work and is usually cut down to a reduced jet to obviate overloading any portion of the surface through pulling the trigger back too far

The spray stream should be directed over the edge of the mask or stencil and not into it, otherwise



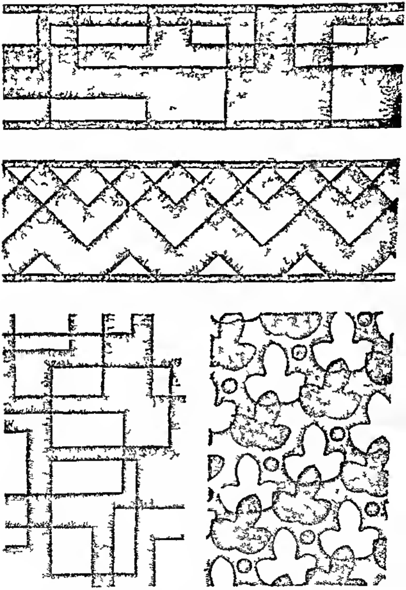
SUGGESTIONS FOR STRAIGHT EDGE TEMPLATES

Fig. 4. Designs suitable for beginners, who should content themselves with experiments along such lines as these and similar ones. Templates may be of plywood of any reasonable size, and no attempt should be made to take on more difficult propositions until these are thoroughly mastered and confidence has been gained.



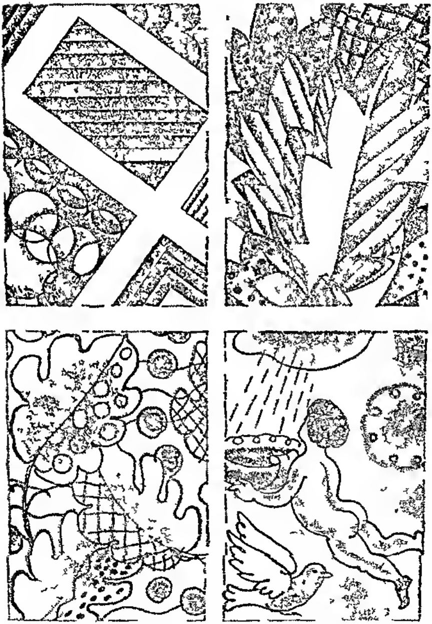
DEVELOPING INTO CURVES

Fig 5 When the student has reached proficiency with straight-edge templates he should go on to a combination of lines and curves (top right) elaborating the designs to circles and segments as depicted in the two bottom designs By following this method he will very quickly become well grounded in the essentials



USE OF BASIC DESIGN ELEMENTS

Fig. 6. Three interesting designs which incorporate basic rectangular and triangular shapes. The design at bottom right demonstrates the use of both the template and stencil of the same unit, and is a good example to experiment with.



MORE ADVANCED DEVELOPMENTS OF DECORATIVE SPRAY WORK

Fig 7 By this method advanced *designs or even lettering come within the* province of the spray painter and many possibilities of original treatment will suggest themselves to the imaginative craftsman after he has acquired some *experience of the technique The two lower sketches are designs of an* ambitious nature carried out by direct spray work without the use of masks

colour is blown under the protecting mask With the mask the matter is fairly simple, but with the stencil, where two opposite edges may lie close together, greater care must be taken to avoid this fault

Plywood Templates

The beginner is advised to commence with a straight-edge template made of plywood It may be of any convenient length but should be somewhat wider than the usual straight-edge to obviate the risk of spray overlapping the back edge He should evolve designs and patterns with this tool alone (Fig 4) After exploring some of the countless possibilities of the straight-edge, he can gradually elaborate his designs by the inclusion of circular templates, segments of circles or, alternatively, by using stencils (Fig 5) The use of the spray and such simple motives so quickly gives expression to thought that it might well form an excellent primary course in the study of design principles

Adding Variety

Basic elements of design (Fig 3), such as the straight, zig-zag, wavy, or undulating line, the circle, square, triangle, and ellipse, the decorative shape of leaves and other natural forms (Fig 6), all provide material to add variety to a pattern or composition. The stencil and template form of any unit of design may be used in the same pattern or decorative composition The beginner should be on his guard against the danger of elaboration

In group (*c*) the spray gun may be closed to a very fine jet, when it will be possible to produce lettering or relatively thin lines, which can be left as finished work (Fig 7) The operation requires a fair amount of skill in the manipulation of the gun (which is held close to the surface), freedom of movement, surety of purpose, and a sound knowledge of design The result is a certain airy or misty effect which can easily develop into a thin-looking design of inferior quality.

Cellulose enamels can be used to advantage on paper, distemper, and water paper Their rapid drying quality is an asset when one part of the design produced by masking has to be quickly laid over another Moreover, the work is cleaner and sharper than is possible with either distemper or water paint

Cleanliness in the operation of spraying is essential to the finished effect

The spray gun is not so individual a tool as the paint brush and there are some operations in which the gun requires extra help in the performance of its functions

When "cutting in" on window frames, or spraying on to surfaces which lie adjacent to a colour or material which must be left clean, some medium must be employed to prevent the paint reaching such surfaces

Usually, the required protection may be given by holding a mask, such as is used in decorative spray work, along the junction between the two surfaces Masking tape performs the function with greater precision, although it is more costly in time and material

It should be realised that the masks used in spray work very quickly become charged with colour and a generous supply of cleaning cloth or rag should be at hand so they may often be wiped

CHAPTER X

COLOUR SCHEMES

STUDY OF COLOUR AND ITS POSSIBILITIES SIMPLE AND INTERMEDIATE HUES COLOUR CIRCLES COMPLEMENTARY AND CONTRASTING COLOURS BUILDING COLOUR HARMONIES PROFESSIONAL TERMS PSYCHOLOGICAL GROUPINGS OF COLOUR SELECTING COLOURS FOR DECORATION PERIOD COLOURS LIGHT-REFLECTION VALUES SUGGESTIONS FOR VARIOUS ROOMS EXTERIOR WORK

PROBABLY no part of the decorator's training is more difficult to master than the study of colour Innumerable books and articles dealing with the theoretical side of the subject almost invariably set down hard and fast rules which not only tend to hinder the student's natural colour sense but, in fact, prevent an interest being taken in what is really a fascinating and useful study

It is not intended, therefore, in this chapter to give definite rules, but rather to offer suggestions which will help the student to explore the possibilities of colour design and to make experiments by which he can render his own colour sense more effective

Colour Shades

Between the complete opposites of light and darkness there is an infinite gradation of colour shades or mixtures The light diffused by the sun appears to be pure white, but it contains all the colours, as is demonstrated by passing a pure white ray of sunlight through a prism

The resulting impressions, or sensations if you will, are registered by the eye as colours It has been computed that between light and total darkness there are 30 000 or more shades of colour distinguishable by the average human eye

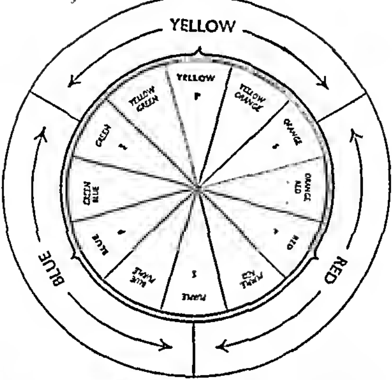
It is not easy to define colour, for the definition would vary according to the occupation or outlook of the individual person attempting to define it The chemist's description would differ from the physicist's, the optician's from that of the psychologist's, but our aim in this chapter is to consider colour as it concerns the decorator his concern with colour is to study and use it as an artist

Radiant Energy

In actual practice, the decorator is concerned with pigmentary or technical colour—colour bought from the manufacturer or pressed out of tubes but to use these so as to produce an æsthetically pleasing result, he should have at least a working knowledge of colour from the point of view of the physicist, who considers colour as light or as radiant energy of various wave-lengths and intensities

He may be a "born colourist" and have an "eye for colour", nevertheless, there are rules of harmony which the decorator should know as thoroughly as the alphabet or the rules of arithmetic

It will be helpful in commencing any study of colour and its use simply to point out a few of the fundamental principles and to offer some practical suggestions that will



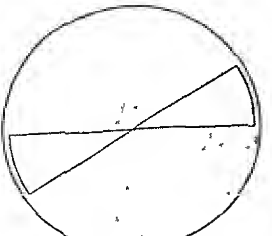


Fig 1. In this chart the three primaries, red, yellow, and blue are shown in the outer ring and again in the subdivisions of the inner circle, midway between these are the secondaries — orange, green, and purple. This *chart is particularly* recommanded to students for its simplicity It is easy to colour and to make. If a slotted neutral grey disc is made and placed on to this circle, pivoted to it so that it can revolve the user will be able to isolate the colour *desired in* one opening and at once obtain its complementary in the other opening

make them serviceable to the purpose of the decorator There are really only three main points to take into account, and to understand these clearly will help very materially in acquiring practice in the proper use of colour

(1) The stimulus, or the source, or the conditions which the eye interprets as colour sensations
(2) The reception and expression or interpretation of these conditions
(3) The effects produced by the colour sensations

Visible Phenomena

The essential extract from the dictionary's definition of colour is "a property of visible phenomena distinct from form and from light and shade, depending on the effect of light of different wave-lengths on the retina,' or, put in a more simple way, we can say "colour is a visual sensation different from the sensation of form or shape and different from the sensation of light or shade '

To put it even more simply "You see individuals or things first as definite forms or shapes, secondly, in different shades of light and dark areas and, lastly, in different colours "

It is easy to demonstrate the truism ' without light there can be no colour ' Between the extremes of the positive and negative principles of pure light and total darkness, impressions represented in painting by the elementary colours of white and black, there exists an infinite gradation of shades or mixtures called greys It should be noted here that the value of a colour is distinguished by its position in this scale of gradation from white down to black

Again, it can easily be demonstrated and should always be borne in mind that white light is a mixture of a large number of coloured lights In the arched solar spectrum of the rainbow the pure white light of the sun is deflected or refracted from the raindrops and the bow is seen in the atmosphere to consist of red, orange, yellow, green, blue, and violet

The same six normal colours can be seen and, of course, in the same order, if a pure white ray of sunlight is passed through a triangular prism The light is broken up into a band revealing *all* the colours of the spectrum, those immediately recognisable being red, orange, yellow, green, blue, and violet and in that order, symbolised by the letters R, O, Y, G, B, and V

These six are called "simple hues," and the colours lying between them — red orange and yellow-orange, yellow-green bluegreen, blue-purple and red purple — intermediate hues,' designated by the symbols RO, YO, YG, BG, BP, and RP

Though they are not used by experienced colourists and may tend to hinder a right development of the colour sense, nevertheless the student would find it helpful to familiarise himself with the relation of these primary and secondary colours by making a colour circle (as illustrated in Fig 1) and two variants of such circles are given

Colour Circles

It is not possible to secure pigments which correctly represent each of the spectrum colours, but to approximate these for the purpose of making a colour circle it is suggested to all those so interested that the following will be useful:

	Water Colour	Oil Colour
Red	Scarlet vermilion	Poppy red
Yellow	Chrome yellow	Chrome yellow
Orange	Chrome orange	Chrome orange
Green	Chrome green No 2	Middle chrome green
Blue	Cobalt and a little ultramarine blue	Light ultramarine
Violet	Cobalt violet	Permanent purple

The three primary colours are *approximated in Nature* by the following—red by the geranium, yellow by the lemon and blue by the sunny midsummer sky

It will thus be seen that the following colours are complementary and contrast harmoniously

Primaries	Yellow	Violet
	Red	Green
	Blue	Orange
Secondaries	Yellow-orange	Blue-violet
	Orange red	Green blue
	Violet red	Yellow-green

The colour circle illustrated in Fig 2 demonstrates the foregoing principles.

Besides the *primaries* and the *secondaries*, which are obtained by mixing two of the primaries in about equal parts, there are the *tertiaries* obtained by mixing two of the secondary colours, orange and green when mixed producing citrine, orange and violet producing russet, green and violet slate

The following tabulation shows quite clearly how the three main groups of colours—primary secondary, and tertiary—are obtained

It will be noticed from this tabulation that each tertiary colour *contains the three primaries with* one of them in greater amount than the other two, so that in russet there is a larger proportion of red, in citrine of yellow, and in slate of blue

Building Colour Harmonies There are two simple methods of providing harmony by combining colours which have something in common

(1) Monochromatic or a one hue scale

(2) Adjacent or neighbouring colours

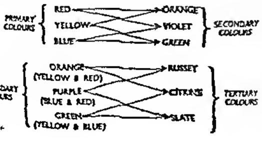
Selecting Cootrasts

There are two simple methods of selecting contrasted colours which harmonise

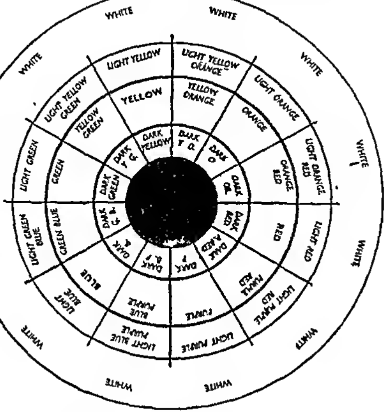
(3) Complementary colours

(4) Triads or triangular colour schemes

The four small charts (Figs 3–6) explain in a simple *manner* these four principal methods of using a colour or combining colours or hues for decorative schemes



(1) *Monochromatic or one hue schemes* (Fig 3) Dominant harmony or a one-hue scheme is that worked out within one scale or around one colour It is



EXPERIMENTAL COLOUR CHART

Fig 2. This is another chart which the student will find useful, and especially if he makes a *coloured copy*, as in the case of Fig 1, *with pigments In the diagram* shown above, only two gradations are given of each respective colour, but if, say, a series of six concentric circles is used and the gradations from dark to light clearly defined, not only will the chart prove even more useful for reference purposes, but the actual preparation of it will be of real practical value It would further add to the usefulness of this chart if a series of slotted discs were made for each concentric circle It is suggested that the chart should be enlarged up to at least 2 ft. *in diameter, and made so that it will withstand frequent usage*

essential to remember that any hue or colour can be dark or light in value, dull or bright *in intensity* Supposing the dominant hue to be blue, the shades of it may range from the palest of sky-blue to the deepest indigo Grey-blue may range from a grey with only a comparatively small touch of blue in it to blue that is merely slightly grey

All these are the possibilities of one hue and constitute a colour scale *For* sky-blues and greens and greys to be considered of one scale they must swing around the same kind of blue There are royal blues, blue-violets, and blue-greens, each of which is a different colour or hue and with its own scale.

(2) *Adjacent or neighbouring*

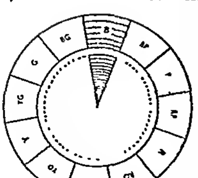


Fig 3. Monochromatic schemes.

colours (Fig 4) An analogous harmony is a colour scheme in which two or more adjacent hues plus their tints, shades, and greyed variants are used Though adjacent hues occupying half the circle can be used, it will be safer to build up a decorative scheme from a smaller arc of neighbouring hues When adjacent colours form the basis of a scheme, complementary accents should be added for contrast

(3) *Complementary colours* (Fig 5) Complementary colours are those directly opposite each other in the large charts illustrated in Figs 1 and 2 The complementary of orange, for instance, is *blue* If our orange tended toward the yellow rather than to the red, its complement would tend to the purple rather than to green As with monochromaticorone-hueschemes so with complementary colours—a variety of dark and light values and of bright and dull tones adds immeasurably to a pleasing decorative effect.

Generally speaking, a complementary colour scheme is pleasing for a greater length of time to most people than either the monochromatic or analogous harmonies

(4) *Triads or triangular colour schemes* (Fig 6) For three-colour combinations, one colour is chosen and an equal sided triangle formed from it to any other two colours. The longer the sides the more *intense the contrast* Wherever the points of any one triangle fall you have a triad Though these three colours are harmonious they should never be used in equal intensity but in different quantities and strengths

Since this chapter is primarily intended to assist the practical decorator we will go back to Fig 1, and suggest in turn colour groupings based on each colour shown in the circle Many of the colours named have, of course, been "greyed" The groupings presented make no claim to completeness, but are merely offered as a guide to the placing of colours in their various categories Individual colours may vary in hue, brilliance, and strength according to manufacturer

Yellow All yellows not greenish or of an orange cast, such as aureolin, banana, buttercup, cadmium yellow, champagne, canary yellow, ecru, lemon, original army khaki, maize, Naples yellow, straw,

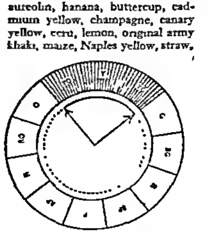


Fig 4. Chart showing adjacent or neighbouring colours

primrose, satinwood, Spanish yellow, spectrum yellow, sulphur, yellow cream, etc.

Yellow-orange All yellows containing red (until they arrive at the orange stage), such as apricot, beige, cadmium orange, chamois, Chinese orange, chrome orange, cinnamon, corn husk, cream, gamboge, middle stone, light tan, vanilla, natural wood, etc.

Orange Colours specially representing yellow and red, such as golden brown, golden buff, warm cream, old ivory, natural leather, brown mahogany, oak, roman ochre, burnt orange, transparent gold ochre, russet, etc

Orange-red All reds containing yellow, such as copper, coral, cadmium scarlet, flesh, natural mahogany, transparent red ochre, mars orange, peach, brick red, light red, burnt russet, salmon, sienna, terra cotta, terra rosa, orange vermilion, scarlet vermilion, etc

Red All reds not bluish or of an orange cast, such as begonia, deep cadmium red, cardinal red, castilian red, red cherry, Chinese red, red mahogany, old rose, post office red, signal red, new deep spectrum red, Union Jack red, vermilion, etc

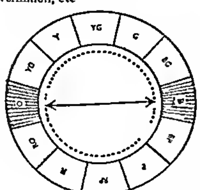


Fig 5 Complementary colours.

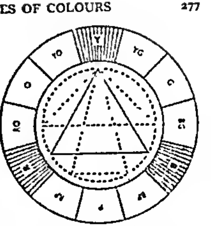


Fig. 6. Triads or triangular schemes

Purple-red Purples predominantly reddish, or reds purplish, such as alizarin purple, beetroot, cerise, crimson, garnet, magenta, purple lake, purple madder, raspberry, violet carmine, etc

Purple All violets not predominantly reddish or bluish such as heliotrope, lavender, lilac, mauve, pansy, petunia, royal purple, mineral violet, spectrum violet, wistaria, etc

Blue-purple Purplish-blues or bluish-purples, such as cornflower, iris, midnight blue, periwinkle, cobalt violet, parma violet, ultramarine violet, etc

Blue All blues not greenish or reddish, such as adonis blue, alice blue, cerulean blue, empire blue, forget-me-not, French ultramarine, garter blue, larkspur, mineral blue, new blue, oriental blue, salvia, saxe blue, smalt, sky blue, steel blue, etc

Blue-green All bluish greens or greenish-blues, such as extra deep Brunswick green, chrome green No 3, myrtle, reseda (or mignonette), etc

Green All colours balanced almost equally between blue and yellow, such as apple green, almond green, green beetle, bottle green, mid Brunswick green, cobalt green,

emerald, evergreen, hunter's green, jade green, leaf green, malachite green, mistletoe, spectrum green, viridian, etc

Yellow-green All yellows predominantly greenish or greens noticeably yellowish, such as bronze green, pale Brunswick green, cedar green, chartreuse green, cadmium green, grass green, moss green, green muscat, olive green, pea green, etc

Recognised Terms

Before proceeding to say something in detail concerning the basic colours representing the foregoing *groupings or families, it is essential* that the student should be quite clear in his mind as to what is meant by the recognised terms used by professional colourists It is suggested that the student refers to Figs 1 and 2

Hue The dominating characteristic content of a colour distinguishing one colour group from another, as a red from a yellow or a green from a blue, etc It need not be a pure red, yellow, green or blue, etc So long as it can clearly be included in the red, yellow, green or blue, etc , group, it is given the designation of its group, except that it is called *a tint, shade or greyed form* of the spectrum or pure colour

The six "simple hues" are red, orange, yellow, green, blue, and purple, whilst the other six hues in the chart are called "intermediate hues"—orange-red, yellow-orange, yellow-green, green-blue, blue-purple, and purple-red

Tints The name given to light gradations of a colour, produced by mixing white with it

Shades The name given to dark *gradations of a colour,* produced by mixing black with it.

Value. Whether a colour is dark or light If a colour is dark, its value is *low;* if light, *high.*

Chroma Often called tonal value Relative brilliance or dullness of colours when compared with white or black. If a colour is bright, its chroma would be high, if dull, its chroma would be low Yellow, for example, has a light chroma; purple a dark chroma

Balance The qualitative use of colour in area, tone, and intensity

Emphasis The accentuation of a decorative feature or particular area achieved by making it either lighter or darker than its surroundings or background

Accents Those small touches of bright or contrasting colours introduced into a scheme to give it sparkle and life

Warm Colours The red-yellow-orange arc of the chromatic circle extending from yellow-green to red-purple; psychologically stimulating and warming and suggestive of fire and sunlight

Cool Colours, The blue-violet arc of the chromatic circle extending from blue-green to blue-purple, psychologically restful and soothing, and suggestive of the colours of water, ice, foliage, and distance. *Generally speaking, any colour is* cool as it is blue and warm as it is red

Neutralised Colours "Greyed" or subdued colours or pure colours which have been "let down" by mixing with them a small amount of their complementary colour, or sobered by the addition of black or grey

Advancing Colours Sometimes called ' near ' colours the reds and adjacent colours have an exciting influence, and seem to "come forward." This emotive influence

extends through red-purple, crimson, scarlet, orange, and yellow, and is most powerful and fiercest with deep orange

Psychological Groupings

Through association and usage colours have come to have specific attributes, and these must be taken into account in any study of colour and application of its use and power by the decorator. Sometimes called the "language of colours," these psychological effects, or associative usage of colours, may not all be fundamentally sound or consistent, nevertheless it is a recognised fact that certain colours have pronounced powers and can produce a definite mood

The following are the five main groupings —

(1) *Dark cool colours*, such as those in which blue is the dominating hue, suggest heaviness, weight, reserve, mystery, and even depression and foreboding melancholy
(2) *Light cool colours*, on the other hand suggest delicacy, expanse and freshness, solitude, rest, peace, and hope
(3) *Dark warm colours*, such as those in which the reds predominate, suggest richness, vitality, power, and stability
(4) *Bright warm colours* such as orange, orange yellows vermilion, scarlet, etc suggest strong sunlight, excitement, exhilaration, movement
(5) *Light warm colours*, such as the creams, pinks, etc, suggest loveliness, delicacy, femininity, cheer, delight, and hospitality

From the foregoing it is at once evident that the effectiveness or otherwise of any decorative scheme will depend mainly on its colour appeal and the appropriateness of the colours for the particular room or scheme in hand Practicability will of necessity have to be considered as well as many other factors, such as the room's source of light, its character, and the personality of its user

Some of these considerations will be discussed in more detail later in the chapter, but meantime it will be helpful briefly to consider some of the fundamental characteristics of the principal colour groupings

Fundamental Characteristics

Yellow The brightest and most cheerful colour—"light of heart" It is the strongest contrast to black, and is used mostly for lightening dark rooms, but "glares" in those strongly lighted Pure yellow as a pigment is easily debased by other colours Note how in nature yellow flowers seem to sparkle amidst green foliage

Orange The most powerful colour, it has the potency of its two constituents, most pleasant in decoration when the yellow element is in excess of the red, giving the golden browns and tans When the red predominates the colour is hot, aggressive, and unmanageable

Red The most vivid and pure colour, is exciting and stimulating, associated with the idea of fire, passion fervour It is fiercest when nearest yellow Not suitable for walls of small rooms—gives a sense of imprisonment It is most effective when used for accent, a red necktie has more appeal than a red suit! It gives a degree of warmth to all colours, especially yellow Used sparingly by nature

Green The most varied of the colours and possibly the most used

in decoration throughout the ages With flowers, it is the general harmonising colour of the foliage and its realm in nature is almost boundless The student should study the varied character of this colour in plant life and note the relationship between foliage and flowers No matter what the colour of the flowers may be, there is always a prevailing hue or character in the green colour of the foliage by which it is harmonised with the colours of the flowers

It is the colour of faith, hope, youth, life, and resurrection, and is a symbol of immortality

Basically, it is a cool colour and has a tranquillising influence, though there are warm shades of green

Blue Is a receding colour, restful and cool, associated with truth—hence the phrase 'true blue' —dignity divine contemplation It is the dark element in all other colours According to the amount of blue in it, so a colour is cold or otherwise Pure blue is the coldest colour "blue with cold" is not *merely figurative language* The deeper blues are depressing It is most powerful in strong light but is neutralised by declining light

Purple The largest and most interesting group of colours and also the most retiring of positive colours, nearest in relation to black and shade The name includes both red and blue purples It is the colour of royalty, dignity, mystery and sadness suffering and sacrifice, a colour rich with opportunities for decorators who will explore its possibilities

Note —The term *colour* is ambiguous when applied to the neutrals—white, greys and black—yet the decorator must regard them as colours, for they are composed of and take in all colours

White is the colour most extensively used in decoration and is the most advancing, harmonises with all colours, and is the contrast of black, and when mixed with it forms various greys Especially useful when creamed and when used with grey Is seriously cheerful, and for that reason is used to brighten without conveying gaiety

There are as great a number of variations of white as any other colours, in fact, a most delightful scheme can be evolved using some of these variations, depending on small touches of intense colours for the accents

Symbolises purity, innocence, peace, modesty, and delicacy

Black The most retiring of colours and one of the most powerful In its purity is a cold colour and gives this quality to all light colours Must be used with care where hue is of more importance than shade At its best, it possesses endless depth When used with discretion, it gives vigour and brilliance to *other colours*

Symbolises death, mourning, tragedy, and silence, nothingness, but when used with white loses its severer meaning

Pageant of Colour

These associations of ideas with colours are not by any means complete—the pageant of colour is spread out over all countries from the most primitive times to the present day Standardised usage of colour is mostly confined to ecclesiastical symbolism, and significations are not all consistent or fundamentally sound

History, literature, and daily life all provide the interested student

with opportunities to explore this aspect of colour usage

Psychological reactions to colour are not only the outcome of innate colour preference, but because of an awareness to established usage and individual conception of the colour appropriateness for the particular scheme under consideration

Different aspects of colour appeal strongly to different people with some the attention is concerned with the colour itself and its qualities as a colour, with others its effect is the main consideration—it is either pleasing or displeasing, soothing or livening, cooling or warming With some, colour preference is determined by æsthetic association of ideas such as truth, joy, sadness, death, fire, jealousy, superstition

Sufficient has been said of the psychological effect of colour Opie's statement is a proven fact "Every passion and affection of the human mind has its appropriate tint, and colouring, if properly adapted, links its aid, with powerful effect, in the just discrimination and forcible expression of them, it heightens joy, warms love, inflames anger, deepens sadness, and adds coldness to the cheek of death itself"

In the building up of any colour scheme, knowledge of the elementary and simple theories of colour is essential, but only practical experimentation with actual colour will make the theories comprehensible

Only a comparatively few people react to colour in the fullest degree and even then reaction is distinctly individual A good colourist is mostly so by instinct and has what is colloquially known as "an eye for colour", but a colour sense can be developed not only by continued practice *with* colour, but by noticing colour all around one

Classify the colours seen, pick out and name the individual colours and tones of colour. Carefully analyse the decorative compositions of such artists as Frank Brangwyn, Charles Ricketts, Gerald Kelly; the theatrical sets of Gordon Craig and Oliver Messel

Observe the contrasts in Nature's colourings of flowers and their foliage, of flowers themselves, of the plumage of birds, butterflies and shells, the rich silks and decorative brocades, particularly those of the Louis XV period, with their skilful blendings of light and elegant colours

Note not only the general colouring but the individual hues, their value, intensity, and area Colour science may produce certain recipes, but there are none that can be followed blindly in working out colour harmonies

Source of Light

The first important factor to consider in selecting colours for decoration is the source of light or, in other words, the room's aspect Rooms with sunlight, facing south or west, call for the use of the cool colours—those on the Chart in Fig 1 in the arc from green through purple Rooms with cold light, facing north or east, need sunny colours—that is, in the arc from orange through the yellow group In some rooms, sunlight enters at different times of the day

Depending on the time of the day when the room is most used, either cool or warm colours are suitable It is not wise to use large areas of warm colours of great

intensity in a room which gets a great amount of sunlight, nor use cool colours in a room which gets a very small amount of natural light

The next point for consideration is the use of the room—is it a bed-room or dining-room, formal or informal? Who uses it—a man, a woman, or a child? What is the type of the room—is a period pre-dominant? What are the colour preferences of the individual using it? If the carpets and soft furnishings are previously selected, then these more or less dictate the colours for the walls and wood-work

Do not attempt the extraordinary or unusual, within the boundary of the colour rules there is infinite variety without indulging in ec-centricities Resolve to memorise the colour chart, the position of the colours in it, the position of the three primaries and the three secondaries, for from these colours come all the shades, tints and variations you have ever seen Remembering this, the study and practice of colour becomes simple

Another principle constantly to bear in mind is that related colours (colours from the same family) look well together Complementary colours also and different shades of the colour (varying in degree of intensity) look well together

To Match Colours

If colours have to be matched, have a sample of the colour to be matched and do not 'carry it in your head' Often room schemes are built up from the furnishing fabrics to be used in the room, the colours you suggest for the walls and wood-work must not only harmonise with existing furnishings, but have correct values, whether clear, bright colours or greyed tones are used

Matching of colours should be done on the spot where the actual colour is ultimately to be used

Period Colours

In each decorative period certain colours were most used Decorators should know these and be able to recognise authentic period colours Only those periods are mentioned here which are generally used in present-day decoration

Louis XV Feminine colours—dusty rose, soft blue, pale pink, fawn, grey, grey-green

Louis XVI Subtle colours, most of them from the cool side of the spectrum, delicate, affected and pretty colours, associated with Marie Antoinette Also, the more formal colours derived from Greek sources and influenced by the painter David

French Provincial Simple colours Toile de Jouy tones of red and blue, russet colours

Empire colours For colour purposes linked with Directoire, heavy colours, red and green predominating A study of authentic Aubusson carpets is a good source for the colours of this period

Chippendale Clear, livable colours, deep value, but soft tones of red and blue, clear yellow, reseda green

Particular note should be taken of the rich wood colours used and, when possible, these should be introduced

Hepplewhite and Sheraton Clear, gay colours, more pastel than Chippendale colours

Adam Pastel tints, powder blue and soft yellow, dove grey and pink predominating

Regency Similar to Empire

colours, though lighter in value Present-day interpretation of Regency leans toward softly greyed colours

Victorian (the Mauve Decade) Deep, pompous colours, often in strong colour combinations with a leaning toward purple and violet shades Thundery browns and bottle greens Usually, white woodwork and mahogany or walnut

Study and Experience

Chapter I has dealt fully with the various pigments used in the manufacture of paints, and likewise with the composition of the coats of paint for specified purposes, but all the information given is of no avail unless the young decorator will himself make experiments and familiarise himself with the various finishes and effects obtainable with pigmentary colours

The results of such experiments should be carefully noted, and where the colours produced by different manufacturers are used their variations should also be recorded, for just as the practising easel artist selects his colours from different makers because a particular colour is better from one source than another, so the wise decorator will exercise discrimination in selecting the sources for obtaining his pigments

Paint is not "just paint"—something merely to cover a surface, purity and uniformity of colour are essential If a job is to last and to stand a good deal of wear, then the colours must be fast, and pigment and binders be of the best quality It is useless to expect good colour work with cheap and poor colours

Also, it is not sufficient for the would-be master decorator to rely on a good foreman or a good colour mixer, he should have not only a technical or theoretical knowledge of colour and colour mixing, but should be able by practical experience to supervise the foreman or colour mixer in the exacting task of matching colours

Colour matching should always be done in a good light, for as has already been pointed out, intensity of colour varies according to whether the colour is seen under natural or artificial lighting—the latter again varying according to the method of lighting used Of course, natural light will vary also, according to the amount of sunlight during the day All these factors must be considered

The colour to be matched should be closely examined and its dominant hue decided, in other words, break up the colour by analysis and then experiment with very small touches of colour on a clean piece of glass with a palette knife, brushing out with a small fitch the result of the experiment on a similar ground to that on which the actual bulk colour will eventually be applied

It seems almost superfluous to add that the colours should be mixed and decided in the room to be decorated but there is nothing so valuable in ensuring success in colour matching as "trying it in position" and noting the effect

Proven Makes

With regard to the various binders and ingredients which go to the mixing of paint, the reader will find detailed in another chapter information as to these, but just as with pigments, so it is essential that all the ingredients which go to the making of colours should be of the best quality, otherwise an

entire decorative scheme may eventually be ruined

Apart from the mixing of pigments for straightforward work, experiments with glazing are essential if subtle colour effects are to be obtained Differences in finishes, such as flat, eggshell gloss, etc, should all be noted as to their effect on the finished appearance of a given colour The use of two finishes, such as a flat finish with a full gloss finish, even of the same colour, will often make all the difference to a fine decorative effect

There are a hundred-and-one tricks of the trade which should be known to the qualified decorator, and only experiments and familiarisation with seemingly humdrum processes will gain for him knowledge and experience in these basic details of the painter s trade

Further, unless the young decorator will make it his business to understand the elementary facts about colour harmony, he will find that he will never be esteemed as anything other than just a house-painter

Training in colour mixing is absolutely essential for every decorator, and he should know how to combine colours to develop new tints, tones, and shades

Study the Chart

And now just a word as to the handling of particular decorative problems Bear in mind that the home which you have to decorate is your client s and not yours You may know better or think you do, than your client as to the type of decoration or colour scheme which will best suit his room or his personality You will have opportunities to offer advice, and such advice will only be accepted if it is felt to be the outcome of knowledge and experience

Whatever you do by way of colour scheme or wall treatment, remember it is the *background* for your clients, it must be a harmonious complement to the individuals in the house Don't push the latest fad in decoration on to your client; often these eccentricities are things of the moment.

Familiarise yourself with good traditional work, and note the effect of certain colours with certain materials, such as woods and silks, the decorative value of various textures, and especially take into account the particular use to which the room you are to decorate is to be put

You may be asked, for instance, whether the room will look best painted or papered, and be expected to give reasons for your decision If it is a plain paint scheme, you may have to decide what its finish is to be and whether this is to be achieved by means of paint or distemper, if a paper is to be used, whether it is to be a patterned or a plain one

If a wall paper is to be used it will more or less govern the choice of colour for the woodwork. All these considerations will have their influence on the ultimate colour scheme for the room

In the next chapter in this book, dealing with wall paper and paper-hanging, some useful hints are given on the selection of wall-papers for different apartments. The reader is advised to link the remarks in this next chapter with what is said here regarding the treatment of the various rooms in an average house

To the decorator who appreciates good design, colour, and texture,

	Per cent		Per cent		Per cent
White . .	89	Light grey .	66	Eau de-nil .	54
Light ivory .	81	Buff .	66	Sky blue	52
Ivory . . .	77	Opaline green	66	Fawn . .	43
Cream . . .	75	Light tan .	60	Gull grey .	43
Ecru	68	Light sky green	59	Old rose	23
Shell pink . .	67	Hydrangea pink	55	Black	2

there is an opportunity with wall-paper to reveal his ability and to help his client to select the right wall-paper for the apartment to be decorated With no other decorative material are there so many opportunities to introduce colour and design into a room, and at such comparatively low cost, and for this reason wall-paper must be reckoned as one of the decorative materials making the most important contribution to the æsthetic quality of a room

The decorator should familiarise himself with the various types of wall-papers; he should know something of their light-reflection values, bearing in mind that the coarser the texture the more diffused is the reflection of light, the texture scattering the rays of light, diffusing them, and giving a quality essential to æsthetic pleasure

The same remarks apply to the various types of paint, whether gloss, matt, or eggshell finish in oil paints, in the oil-bound water-thinned distempers, and in the plastic paints also

Other Treatments

Not only is texture of importance as regards light reflection but its very quality invites other decorative treatments, such as gradation of colour, glazing, scumbling, or decorative brushwork

Appreciation of the value of appropriate textures should be much more cultivated by the decorator than is often the case at present, for in this there are almost unlimited opportunities

Here a word of caution must be added that where plastic paints are used, whilst thickness of application depends on the type of texture desired, it is not necessary, neither is it desirable, to use these materials in a vulgar and coarse manner, the most beautiful textures are those worked in the lightest relief So much depends on the ultimate scumbling and glazing of these light texture effects

Light-reflection Values

In recent years attention has increasingly been given to the comparative reflection values of colours in gloss and textured surfaces and in varying materials For our purpose here, reflection values are given for gloss paint only and on smooth surfaces, but it should prove valuable to the decorator to make his own tests

As has already been said, consideration of texture is of the utmost importance, particularly to the interior decorator handling furniture and furnishing materials oak, for example, is entirely different in texture to satinwood or mahogany, silks and damasks to reps and linens, and the varying textures of papers to paints whether glossy, eggshell finish, or matt

The stepped list at the top of this page will be of some help in estimating the percentage of light

reflection of colours in everyday use

As will be seen, white provides the maximum light reflection and black the minimum Though the darker colours have less reflection value, they are, nevertheless, extremely useful in any decorative scheme when used in right proportions

A few general suggestions are given which may help in the approach to the decoration of various apartments Keep constantly in mind that in the creation of a colour scheme RESTRAINT should be your watchword, restraint in colour in dominant areas, reserving intensity of colour for the small accent notes

An almost universal law of colour which should also be remembered is that the larger the area, the more subdued should be the colours—the smaller the area, the more intense may be the colours

Another useful precept to follow in selecting patterned wall papers for colour in the background is the proportion of patterned and plain areas should roughly be three parts plain surface and two parts patterned surface

Stimulating Imagination

It is important to note that the schemes suggested may on first sight appear bizarre and unusual, they are, however, intended to stimulate the imagination and to get the decorator to break fresh ground

Proportion and intensity of the colours specified will, of course, vary according to the size, shape, and lighting of the apartment They are merely given as suggestions The colours named are taken from the British Colour Council's Dictionary of Colour Standards This work and its companion volume, should be in the possession of all interior decorators

Colours given for floor treatment refer to carpets or linoleum Selection of fabrics for furniture will depend largely on the wood and its finish Under "Accents" the colours given refer to the small intense notes such as cushions and lampshades and rugs

Principal Rooms

The Bedroom Determine the orientation of the room and the amount of sunlight it receives If the room is dark, then bright colours are called for Get the impression of brightness into the room, and some sparkle

If a paper is chosen, consider the scale of the design in relation to the size of the room Visualise the general colour effect of the paper with the wood of the furniture, there may be special pieces of furniture which need emphasis, if so the background colours are of the utmost importance

Woodwork already overloaded with mouldings needs, as a rule, self colours and no further emphasis by picking out' with several colours

Bedspreads are often the accent note or the most important colour note in the room, colour notes are provided as well by lamp-shades and cushions The reflection in mirrors of the light from the windows will often give the sparkle needed to liven an otherwise dull room

Strive for colourings that are restful yet not dull, and make a particular note of the colour of the window drapings, especially if a window netting is used, as window

TABLE I. COLOUR SCHEMES FOR BEDROOMS

WALLS	CEILING	WOODWORK	FLOOR	FURNISHING FABRIC	CURTAINS	ACCENTS
Eau-de-nil	Light warm *cream*	Ivory white	Deep *petunia*	Light *petunia*	Amaranth *pink*	Blossom pink
Hydrangea pink	Light lichen green	Ivory white	Old rose	Opal ne green	Old rose	Carnation
Oyster grey	Flesh	Light *oyster grey*	Saxe blue	Old rose	Alice blue	Amaranth pink
Honey-suckle	Honey-suckle	Pearl white	French grey	Old rose	Opaline green	Chartreuse yellow
Vanilla	Light warm cream	Light vanilla	Juniper	Light juniper	Old rose	Turquoise green

draperies such as gauzes, muslins, and silks all have their individual effect on the light which enters the room

Have regard to the characteristics of the person or persons who are to occupy the room Primary consideration should always be given to the personalities you are dealing with

It may be that the colour scheme will have to be built around one or two key pieces of furniture or furnishings—if so, find out what these are

The treatment of a man's bedroom should be different, say, from that of a young lady's bedroom, and the guest room, no longer looked on just as a "spare room," should convey a spirit of hospitality, enabling pleasant impressions of comfort to be carried away by the guest

A few suggestions are given in *Table I* for bedrooms

The Bathroom Where porcelain fitments are installed, or tiles used, their colour will set the keynote for the colouring of the walls and woodwork, but pleasing contrasts can be made Here, again, light tints are preferable, keeping the dark tones for the floor and skirtings Keep the weight on the floor

If the porcelain fitments are a light pink, for instance, there is no reason why the walls should not be a clean light green Again, in some bathrooms there may be an alcove, which can be painted in a different colour from the rest of the bathroom

Keep to clear, refreshing colours and light pleasing colour contrasts

The Lounge or Living-Room This room should be colourful, comfortable, and "livable" and express the joy of living, affording relief from the workaday round If the room is formal, it should express graciousness, it should be unpretentious, with quiet, restful colourings Study carefully the character of the particular room, for colour effects and design can have a psychological influence and inspire quiet relaxation or social activity

Usually, this room is the "show" room of the house, and this distinction should be quietly obvious in the decorative scheme

Table II gives a few suggestions for colour schemes for lounges or living rooms

The Dining Room Again the

TABLE II COLOUR SCHEMES FOR LOUNGES OR LIVING-ROOMS

Walls	Ceiling	Woodwork	Floor	Furnishing Fabric	Curtains	Accents
Gull grey	Light salmon	Light gull grey	Mace	Black	Light golden brown	Amethyst
Light gull grey	Light coral	Gull grey	Brick red	Grebe	Olive green	Ivory Old rose
Shell pink	Pearl white	Shell pink	Wedgwood	Amethyst	Natural linen	White petunia
Banana	Light honey suckle	Banana	Mastic	Chestnut	Smalt	White orange
Primrose	White	Light gull grey	Gunmetal	Oakwood	Rose pink	Silver White

orientation of the room will largely determine the choice of colours

The dining room should be pleasant, for it is here that meals are enjoyed and company entertained What has been said with regard to the bedroom is equally applicable here as far as general principles are concerned Unfortunately, colour of existing features in the room, such as fireplace tiles, for instance, may have to be considered, the woodwork of the furniture certainly must, so must the carpet if it already exists

Aim to create an atmosphere of dignity and yet one of cheerfulness Give consideration to the room's position in relation to adjoining rooms

The treatment of the walls, that is of the background of the room, is of great importance, too much insistence cannot be made on the creation of the background in attractive interiors Wall paper backgrounds, therefore, for dining-rooms should be conventional in design, bearing in mind the more or less formal character of the room.

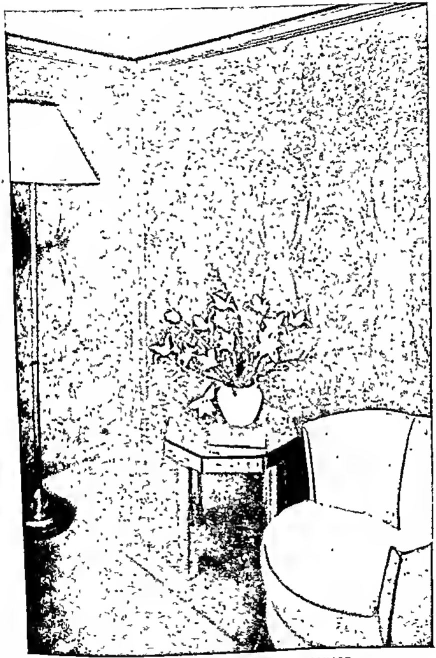
Essential Background

If the student will bear in mind this simple little analogy it will help to drive home the emphasis placed in this chapter on the background. It is this in a theatrical production it is the scenery which very often makes or mars a play, it is, in fact, the background for the action of the play, and the wise producer frequently grudges no time, labour or

TABLE III COLOUR SCHEMES FOR DINING-ROOMS

Walls	Ceiling	Woodwork	Floor	Furnishing Fabric	Curtains	Accents
Light apple green	Ivory	Deep ivory	Bottle green	Old gold	Gold	Bunting yellow
Old gold	Light gold	Ivory	Bronze	Chinese red	Grass green	Flame
Sage green	Light sage green	Sage green	Horse chestnut	Mace	Plum	Black Silver
Gold	Light murrey	Gold	Murrey	Carrot	Rust	Jade
Buff	Light olive green	Buff	Oakwood	Brick red	Terra cotta	Spectrum orange

PLATE VII



"BURR WALNUT" PAPER IN A LOUNGE

Realistic reproduction of the grain of burr walnut in a Sanderson wall-paper. The effect is obtained by quartering as with actual wood The richness of this form of decoration creates an atmosphere of dignity and comfort.

ARTISTIC WALL-PAPER FROM CHINA

Chinese designs have formed the basis of many patterns perfected for machine process by English paper designers. Above is a photo of some Chinese wall paper of the middle eighteenth century at the Victoria and Albert Museum, London.

money in obtaining the setting most suitable for his cast

One has only to consider the work of the leading theatrical scenic artists and to compare their work with the tawdry mediocre work to be seen in some of the cheap sets to realise the force of this illustration

Table III provides a few suggestions for dining-room colourings

The Kitchen Here is the woman's workshop, and a good deal of the average woman's time is spent in her kitchen Women nowadays are discovering the value of colour in their surroundings therefore, make this room a pleasant one to work in Clean, light, and cool colourings will help to refresh and inspire the housewife, and make the kitchen cheerful and gay and a pleasure to live in

Washable Paints

A kitchen should always look clean and spotless, and gloss paints or washable water paints are, therefore, most suitable for kitchen work Accent notes of colour can be obtained by painting the chairs or other furniture or even the kitchen cabinet fittings in contrasting colours, and the sales slogan for any decorator in connection with kitchen work should be "Keep the kitchen clean and colourful"

Below are a few suggestions for kitchen colour schemes (Table IV)

The Entrance Hall and Staircase Here first impressions of the house and its owners are received, and the hall is usually the connecting link between the different parts of the house From it, when the doors are open, it is possible to see the decoration of the rooms leading out of it, therefore, the decorative treatment of the hall should link up with the rooms

It is not necessary to have the same colour throughout the lower floor should be a different colour or tone of colour from the staircase and the floor above There should be harmony of colour, and special attention should be paid to the staircase treatment Often the hall is darker than the rest of the house, and therefore, the colourings used can be several tones lighter and more intense than the same colours would be if used in a light room where the sun is in evidence for many hours in the summer months

Remember that if there is a half-landing the woodwork round this half landing and up to the second floor must be considered as part of the first floor The finish of the stair rail, treads, and risers can, therefore, largely contribute to the complete decorative effect, often

TABLE IV Colour Schemes for Kitchens

Walls	Ceiling	Woodwork	Floor	Curtains	Accents
Lichen green	Lichen green	Chartreuse yellow	Moss green jaspe	Primrose	Grenadine red
Sky grey	Pearl white	Sky blue	Royal blue jaspe	Straw	Tangerine
Ivory white	White	Pompadour	Royal blue jaspe	Maize	Crushed strawberry
Champagne	Champagne	Verdigris	Apple green	Ecru	Azalea
Ecru	Light cream	Buff	Rust	Chartreuse yellow	Chartreuse green

the accent note of colour is concentrated in the finish of the handrail Note, for instance, how smart and effective a polished black rail looks with the rest of the woodwork in pleasing tones of parchment

Matching Carpet

Again, remember that the stair carpet will possibly dominate the scheme

The hall is the part of the house which merits the decorator's closest attention, and he should make it his business to collaborate with the client in seeing that the decorative treatment makes the entire house appear attractive

Above are a few suggestions for halls and staircases (Table V)

TABLE V COLOUR SCHEMES FOR HALLS AND STAIRCASES

Walls	Ceiling	Woodwork	Floor	Furnishing Fabric	Curtains	Accents
Deep parchment	Honeysuckle	Light parchment	Royal blue	Almond shell	Pea green	Tangerine
Nettle grey	Light lichen green	Ivory white	Almond green	Corn husk	Amethyst	Grenadine red
Maize	Light cream	Light cream and black	Amethyst	Crocus	Crocus	Begonia
Old ivory	Broken white	Old Ivory (doors only beech brown)	Rust	Bronze green	Jade	Saffron Violet

House Exteriors

Exterior Work The best advice the decorator can give a client concerning this work is "Be *community proud* and *neighbourly*" Discourage eccentricity of treatment, employ colours which harmonise not only with the actual house to be decorated, but also with *adjoining homes*, and which fit into the general setting of the district

The elevation and the type of the house must largely govern its *colour treatment Accent notes can* be obtained by the special colour treatment of the front door The right use of colour can help to overcome architectural problems; houses can be made to look larger or smaller, taller or wider, window openings emphasised or made less conspicuous.

Apart altogether from the fact that a well-painted house is a good investment, a colourful one makes *for home pride* With the greater use of stucco and the large unbroken surface areas in present-day architecture, the decorator must think of large masses of colour, remembering that the door openings and window frames can make the accent note

Some pleasing schemes with these large flat exteriors are obtained, for instance with the stucco work painted white and the door, say, in brilliant green or blue, or the stucco painted a very light grey and the door and sashes in brilliant red, or, again, the stucco work in a light warm cream with the door and sashes in a strong blue and, possibly, ringing the changes with, say, the garage door in a post office

red, which indeed would give a most pleasing contrast

However, these suggestions are offered to start the decorator thinking along lines away from the ordinary orthodox methods in connection with painting house exteriors Today there is a distinct trend toward use of brighter colour, and builders recognise this also in their choice of bricks and tiles

Public Buildings

The use and effect of colour in public buildings such as places of amusement, offices, schools, hotels, stores, and hospitals are not dealt with here, as this chapter is primarily concerned with domestic decoration

It is sufficient to stress the attractiveness of colour in public buildings as follows

In stores it is of definite sales promotion value

In hotels it is attractive

In schools it brightens and cheers surroundings and can aid light-reflection

In hospitals it can be of therapeutic value

In offices and workrooms it is of proved psychological value, it can relieve monotony and contribute toward productiveness and contentment, with the added asset of increased good health

Factors in Use of Colour

It is worth reiterating here that you may know about the properties of mediums and pigments, have a good working knowledge of building up a colour scheme, but you cannot put this knowledge into effect until you realise that

Colour has a definite eye appeal If the right colours are selected, everyone who sees the scheme will derive pleasure from it, and be a potential new customer

Colour has an emotional appeal It pleases or displeases, and the feeling evoked when it pleases varies in degree of intensity from serenity of satisfaction to rapturous elation, or when displeasing, from irritable dissatisfaction to morbid depression

Colour is the basis of decorative work

Colour affects the size of the room Light colours on walls and ceiling make small rooms seem larger Dark colours on the walls bring a room together "

Use a colour vocabulary Know what you mean when you talk about colour to your client, keep abreast of the so called fashion colours, so that when they are named by your client you understand what is meant

Lastly, the use of colour should be governed by a great deal of practical common sense, keeping always in mind the fundamental principles of colour training Good colour schemes are not the result of haphazard guesswork or accident They are the product of careful study and experience

To sum up the craftsman must always remember that general colour and effect are more important than local brilliance The most effective scheme of colour is one that is warm without being hot, grey or pearly, yet not cold, bright, but avoiding gaudiness, effective, without being blatant The scheme in hand should have been discussed beforehand with the client, so it coincides with his personal wishes and the surroundings It is also suggested that students should obtain from leading paint manufacturers a complete range of their colour cards

CHAPTER XI

PAPER-HANGING

TOOLS AND EQUIPMENT REQUIRED CLASSIFICATION OF WALL PAPERS DESCRIPTION OF PRINCIPAL TYPES TABLES AND METHODS OF MEASUREMENT STAIRCASE WORK BORDERS, FRIEZES, AND STILINGS WALL-PAPER DESIGNS WALL TREATMENT CHOICE OF COLOUR, TYPES OF DESIGN SELECTING A PAPER PASTES PREPARATION OF WALLS TRIMMING CUTTING AND HANGING CEILING PAPERS LINCRUSTA, GRASS-CLOTHS AND TEKKO REALWOOD PANELLING BURLAPS AND CANVAS STILING BORDERS CAUSES OF TROUBLE.

WALL-PAPERS were originally produced as economical substitutes for the costly woven coverings, stamped leather, and tapestries once used to decorate walls, to-day they are the most popular 'clothing' for our walls, and there are literally hundreds of designs available from which even the most fastidious person can satisfy his or her taste whether it be in design colour, or texture

Cleanliness Essential

It must be said right from the beginning that in the handling and hanging of wall papers cleanliness of person and workmanship is imperative It is work providing unique opportunities for advancement in the trade Experience will be acquired only after possibly many failures and much wastage of time and materials, but if the young paper hanger acquires the early habit of doing everything thoroughly and with patience he will eventually be able to handle costly materials and tackle the most difficult or exacting job

The following tools are essential

(1) Scissors, one pointed pair, 12 in long and one bull nosed pair, 10 in long, for cutting wet paper
(2) Trimming knives including one of the type used by shoe makers
(3) Casing tools
(4) Steel straight-edge (4 ft 6 in bevelled edge advised) Also a strip of zinc about 4 in wide and about 6 in longer than the straight-edge
(5) Two-fold 2 ft rule (bevelled)
(6) Plumb bob
(7) Chalk line
(8) Smoothing roller, 9 in preferable, felt-covered (This can be re-covered when dirty)
(9) Seam rollers (*a*) Barrel faced, rosewood or boxwood, (*b*) angle rollers
(10) Two smoothing brushes (*a*) Thin, (*b*) thick
(11) Stripping knife (not too wide —4 in is best to handle)
(12) Stopping knife (putty knife)
(13) Small trowel
(14) Washing-off brush preferably a well worn 10-oz distemper brush
(15) Pasting brush can be good 10-oz distemper brush or good quality flat wall distemper brush
(16) Paper-hanger's board and

trestles (folding variety advised).

It is also desirable to have in the kit bag a hammer and some tacks or Moore's push-pins, screwdriver, pincers, spirit level a set-square, pair of dividers, clean rags, and sheets of sandpaper

Wall paper Trimmers

Most paper-hangers now use one or other of the patent wall paper trimmers, those best known being (i) the Ridgely, (ii) the Morgan Lee, (iii) the Champion, (iv) the Possnett

Of the above, the Ridgely is the most widely known and used This trimmer will cut Lincrusta, Anaglypta, also any width strip, wet or dry It can be purchased as a complete outfit, that is trimmer, 6- or 7 ft straight edge, and zinc (Fig 1)

The Morgan Lee is a very efficient tool, weighs only 4½ oz, and can be carried in the pocket There are no parts to get out of order and the cutters are self-sharpening

The Champion is also self-sharpening, and has the additional advantage of being adjustable to trim any selvedge or width strip up to 3 in

The Possnett is a more expensive tool but very efficient it has two guides and a micrometer adjustment

Trimming machines, such as the Oates Empire or J M L, are used by decorating firms with large paper-hanging business They are great time-savers, simple and accurate in operation, trim both edges as required and automatically re wind the roll The cutters are self-sharpening and the machines can be supplied to be either hand or electrically driven There are several types of machine, and each with special accessories for varying types and widths of paper to be trimmed

So much for the equipment of the paper-hanger, now for the types and classification of wall-papers Wall papers are divided into the following main categories

(a) Ceiling papers
(b) Fillings (for the general decoration of wall surfaces)
(c) Dadoes
(d) Borders, friezes and stilings
(e) Corners and other motifs (for the decoration of fillings)

The range of wall papers is so wide and varied that it is impossible to give here a detailed and complete list but any of the types mentioned in the above main categories may be either (1) machine-printed or (2) hand printed

Two Main Groupings

(1) *Machine printed* Most papers in the ordinary 'general' pattern-book are in this class Price is governed by weight of paper, process, and number of colours used in printing the design

(2) *Hand-printed* Printed from blocks wholly of wood or from lino or rubber covered wooden blocks Each colour usually involves a separate block, number of colours governs price It is possible with hand-printing to secure special colourings of designs to harmonise with clients' furnishings Hand printed papers can readily be distinguished from "machines" by the blank unprinted ground at either end of the roll Machine papers, being printed on a continuous

Fig 1. Using the Ridgely trimmer one of the patent hand trimmers which is widely used by paper-hangers

reel and afterward cut into 11½-yd rolls, have the design continuous throughout with no blank ends to the piece

Other Methods

There are various other methods of producing wall papers by hand, some combining hand block printing with stencilling, others wholly stencilled, whilst others are now being produced by silk screen methods of printing but there is a certain "lift and character given to papers printed by the block method which is not obtained by any other means

Machine-printed papers can be divided into two main classes

(i) Pulps (or "Blanks") are the cheapest class of printed wall paper, the pattern being printed on the actual colour of the raw paper "Blotch pulps" are those papers in which the pattern and the background are printed on to the raw paper at the same time

(ii) Grounds A plain ground colour or "undercoater" is applied to the raw paper, providing the proper colour or effect for the background of the pattern, and prevents the raw paper from fading The majority of wall-papers printed to-day by machinery are "grounds"

Principal Types

A brief description of the principal types of wall-papers is given below The list is in alphabetical order

Distemper Ground Exactly described by the name

Duplex Two thicknesses of paper brought together in the wet state and pressed and rolled together, forming one thick paper used a great deal for embossed paper hangings

Embossed Papers run through an embossing machine to obtain a raised effect such as canvas or linen pebble or worked plaster weaves or grass-cloth or other designs Duplexed papers are used for deep embosses

Flocks An imitation of velvet-like cloths one of the earliest types of wall paper The ground or design is printed with a mastic and, while this is still tacky finely cut or ground silk, wool or cotton flock is dusted on to the surface The

silk, wool, or cotton may be coloured to any desired tint Such papers are often 'flocked' several times to increase the height of the pile

Grass cloths Made of woven honeysuckle bark mounted on rice paper Is made in approximately 7½ yd rolls, 36 in wide Hung in the same way as ordinary wall paper They have very largely been superseded by the excellent "imitation grass cloths" now available

Ingrains Rough and shaggy tinted papers, produced by mixing with the pulp in the final process very short pieces of black hair or wool

Jaspés In wall paper, irregularly brushed soft line effects

Leather Effects Reproductions of leathers in a variety of skins and colours, also of the finely textured, richly coloured and highly decorated antique Spanish and Venetian leathers

Leatherettes Embossed papers similar in type and design to Anaglypta Cameoid, and Ligno mur, but much lighter in weight and cheaper Supplied in the white or on brown stock and decorated

Lining Paper is raw stock of various weights and grades without processing or printing and is used for lining walls to improve their surface to take the better wall papers Not only does lining a wall give it a smoother surface but it also absorbs the surplus moisture in the paste and reveals 'hot spots' in the plaster Lining papers are often run horizontally around the room and invariably with butt joints The nominal width of linings is 22 in, and they are obtainable in white, brown, and tints Reinforced lining is white lining paper combined with a good quality muslin cloth, and is used for cracked or faulty ceilings and walls, as well as being useful for partitions instead of scrym and lining paper

Marbles Representations of marble if machine-made, produced by sanitary printing Hand-produced marbles are particularly effective

Metallic Effects Metallised papers, in which ground or some portion of the pattern is printed in imitation gold bronze, or other metallic powders There are also gold-leaf and aluminium-leaf papers

Micas Papers in which either the ground or pattern have been printed by a mixture of finely ground mica, sometimes tinted, thus producing a satiny sheen to the design or ground

Moirés Watered silk effects

Oatmeals and Chip Mottles Often called "oatmeal ingrains," produced by adding in the finishing process very finely powdered wood or sawdust or like material

Oil Grounds Exactly described by the name

Pitch Papers A coarse brown paper surfaced with a layer of tar, used for damp walls

Plastic Prints Surface prints of plastic material producing raised pattern

Polychromes Semi plain papers produced by the incorporation in the pulp of several dyes which are more or less controlled to give polychromatic effects Imitations of these effects are also produced by printing from engraved rollers

Sanitaries Paper printed in oil or fixed colours by intaglio-engraved rollers upon a sized ground They are therefore very hard, and

there are also the woven wall-hangings used for covering walls, such as the prepared backed canvases and burlaps, these are usually in 50-yd rolls, 36 in wide, and are obtainable either undyed or in a variety of colours Then there are the wood faced papers, consisting of very thin veneers of actual wood on paper backings, made in rolls 12 yd long by 36 in wide and obtainable in quite a variety of different coloured woods

Sizes of Wall-papers

(1) English

Hand printed papers 21 in by 12 yd long, *machined printed papers* 21 in by $11\frac{1}{2}$ yd long, which equals 7 sq yd or 63 sq ft, and covers an average of 54 ft super, except on staircases, where waste is considerable

Leatherette, Lincrusta, and Anaglypta Leatherettes are only sold in full rolls of $11\frac{1}{2}$ yd, but Lincrusta, Anaglypta, and Lignomur are sold by the yard in multiples of 3 yd

Backed canvas is usually 36 in wide, in rolls up to 50 yd Lining papers are also sold in 30-in width rolls

(2) French

18 in by 9 yd long which equals $4\frac{1}{2}$ sq yd or 40 sq ft (approx)

(3) American

18 in by 8 yd long, which equals 4 sq yd or 36 sq ft, also 28 in wide "double" rolls of 15 yd length, which equals 11 sq yd or 90 sq ft (approx)

Tables I and II show the number of pieces of English wall paper required according to the size of the room to be papered With experience it is possible for the skilled paper-hanger to tell at a glance the number of pieces required, but the usual practice is to measure round the room with a 2-ft. rule, and to multiply the number of feet so obtained by the height (in feet) of the wall space to be papered, dividing the result by 63 (the number of square feet in a roll), or by 7 and 9, the answer giving the number of pieces required Deductions should be made for door and window openings, and if a patterned paper is to be hung, 10 per cent added for matching and wastage The same method also applies to ceilings Thus, a room 21 ft long by 15 ft wide and with wall space to be papered 10 ft. high gives the following

Walls Two walls 21 ft equals 42 ft, two walls 15 ft equals 30 ft, making a total of 72 ft Multiplied by 10 ft (height of wall space) 72 × 10 ft equals 720 ft Divided by 63, equals $11\frac{27}{63}$, say 12 pieces required, or divided by 7 and then 9 equals 63 equals $11\frac{3}{7}$, say 12 pieces required

Allowing for wastage, and with 10 per cent added equals 13 pieces

Ceiling 21 by 15 ft equals 315 sq ft, divided by 63 (or 9 and 7), equals 5—number of pieces required

Allowing for wastage once more, and with 10 per cent added, equals 6 pieces required

Practical Measuring

There is another method, and one more frequently adopted by the practical paper hanger, in which the number of widths of wall-paper required is obtained by going round the four walls with a roll of paper, or measuring by a rule how many 21 in widths there are,

dividing the result by the number of lengths it is possible to cut from one piece for the height of wall to be covered Small spaces above the door and under windows should be ignored and all the rest reckoned as full lengths

Thus, our room, 21 ft long by 15 ft wide=864 in, divided by 21 (width of roll)=$41\frac{3}{21}$, say 42

As wall space to be papered is 10 ft high, this will mean that only three lengths can be cut from a piece, equals 42 divided by 3 equals 14

This method is always on the ample side, though after making full allowance for doors and windows it gives us 13 pieces, as by the other method The practical workman, however, will undoubtedly develop his own methods in course of time

The same methods are applicable both for French and American papers by dividing the total area by the number of square feet in the respective papers or, if the second method is adopted, using the respective widths and lengths

Staircase Work No positive rules can be given for measuring work for staircases, the walls vary with almost every job and it is, therefore, essential to note carefully the sizes and shapes of the surfaces to be papered In most jobs a number of long lengths with diagonal pieces cut off at the ends, top and bottom will be found to be required

If a large pattern is involved, there will be much wastage owing to these cuts at an angle, and a careful calculation must accordingly be made If a small pattern or a plain paper is to be hung, then the area can be calculated in square feet by taking all the dimensions horizontally and vertically and adding them together, and then adding the area of any triangular space, remembering that the area of any triangle is equal to half the base measurement multiplied by the altitude or perpendicular height

Border Widths

Borders, Friezes, and Stiling Borders are usually sold by the yard, single width, though they are printed on 21-in paper and the number of widths printed on the roll is governed by the width of the design, as follows

21 and 18 in	are printed	1	over
$10\frac{1}{2}$ or 9 in	"	2	"
7 in	"	3	"
5 in	"	4	"
4 in	"	5	"
3 in	"	7	"
2 in	"	10	"
$1\frac{1}{2}$ in	"	14	"
1 in	"	16	"

Borders friezes, and stilings are normally in rolls 9 yd long though some manufacturers make them 12 yd long This should be borne in mind when buying by the roll for stock purposes

Stiling borders are generally 5 in, 7 in, or $10\frac{1}{2}$ in wide

Applied Motifs

Appliqué or Cut-out Decorations are generally sold ready cut out and at so much per set, where more than one motif is required for the complete decoration

Though the various types and classification of wall papers have been described, this does not apply to the designs, of which the principal groupings are

(1) Plains and polychromes
(2) Stripes—narrow, wide, and jaspé, in one or more colours
(3) Spots—including small motifs,

can be lightly sponged; they must not, however, be rubbed hard or scrubbed

Satinettes Papers with a shiny surface produced by polishing with rotary brushes and french chalk or mica

Satins Polished distemper grounds

Silk Fibres Self-coloured paper made mainly from hemp fibres, which give a silken gloss to the surface

Sourettes Embossed self-colour satinette-papers, the design being of the same colour as the ground and in very low relief.

Stipples Stipple effects, produced by hand and machine

Textured Effects Papers suggesting or reproducing texture by printing or embossing or both (*see Embossed*)

Varnished Papers already varnished by machinery with a quick-drying hard white spirit varnish

Wax-finish Papers A dull gloss finish given to certain papers such as marbles, tiles, etc

There are also the following "relief" materials, usually classified as 'high' or "low', those supplied by the roll as 'low," and those by the sheet or panel as 'high" They are available either "in the white' (or undecorated) or ready decorated

Anaglypta A machine-produced hardened embossed paper made from high grade pulp, light in weight, and durable relief with a 'high" hollow back. Name Anaglypta derived from Greek words—*Ana*, meaning raised, and *glypta*, meaning cameo

Cameoid and *Lignomur*. Machine-pressed low-relief materials made from paper pulp

Lancaster Cloth A washable wall covering with a cotton foundation, covered with a special body preparation and a heavy surface coating to render it damp-proof Is made in a variety of designs plains, scumbles, tiles, and marbles It is specially suitable for kitchens and bathrooms and is an inexpensive substitute for tiles It is as easily fixed as wall-paper and is sold in 12- or 24-yd rolls, 21, 45, and 54 in wide

Lincrusta Walton A flexible flat back solid low-relief material made from a composition of which solidified linseed oil forms the chief ingredient Highly sanitary, it is impervious to weather if well painted or varnished The name Lincrusta is derived from Latin *lin* (for linum—flax) and *crusta* (relief), the second name, Walton, being that of the inventor. There are many types of Lincrusta, the best known being the imitation woods, with the large range of appropriate slats for panelling Leathers, silks and textures are all available, either in plain or decorated ways.

Realwood consists of panels and rails which have a surface veneer of actual wood, mounted on a flexible base this enables the material to be cut and hung in much the same way as wall paper It is supplied in a variety of woods and in very many sizes

Rexine is a strong base fabric coated with nitro-cellulose and indelibly grained and is greaseproof and waterproof It is very durable and does not scratch or chip It is supplied in varying designs and textures, and glazed bright or with matt finishes It can be affixed to any type of surface and, generally speaking, the usual methods employed in hanging and decorative

work may be carried out It is sold by the lineal yard, and is in varying widths

Salubra is a non fading, washable oil printed paper, available in a variety of coloured plain grounds and patterns, also in a series of length decorations It is sold in rolls of 10½ yd by 31 in wide

Tekko is the proprietary name of a range of plain and patterned metallic-finished foreign papers, made in 7 yd rolls, 31 in wide

Tynecastle (*a*) Vellum hand-produced parchment like pulp in high or low relief The slightly ivory colour is particularly pleasing, and the high relief designs look like actual modelled plasterwork The nature of the material and the mode of manufacture enable certain "undercut" high relief to be obtained (*b*) Canvas a hand moulded special form of canvas for high or low relief effects Most Tynecastle designs are available either in vellum or canvas (*c*) Leather a more expensive form of material, and specially used for a range of period style designs

Though not strictly coming within the purview of this chapter,

TABLE I —To Measure Rooms for Paper

The figures occupying the spaces where the height bisects the length of four walls of the room indicate the number of pieces of ordinary English paper hangings required

Height in feet from skirting to cornice (or picture rail)	The top line is the measurement round the room in feet including doors windows etc.																		
	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100
7 to 7½	4	4	5	5	6	6	7	7	8	8	9	9	9	10	10	11	11	12	12
7½ to 8	4	4	5	5	6	6	7	8	8	9	9	10	10	11	11	12	12	13	13
8 to 8½	4	5	5	6	6	7	7	8	8	9	9	10	10	11	12	12	13	13	14
8½ to 9	4	5	5	6	7	7	8	8	9	9	10	11	11	12	12	13	13	14	14
9 to 9½	4	5	6	6	7	7	8	9	9	10	10	11	12	12	13	13	14	15	15
9½ to 10	5	6	6	7	7	8	9	9	10	10	11	12	12	13	14	14	15	15	16
10 to 10½	5	6	6	7	8	8	9	10	10	11	12	12	13	14	14	15	16	16	17
10½ to 11	5	6	7	7	8	9	9	10	11	11	12	13	13	14	15	16	16	17	18
11 to 11½	5	6	7	8	8	9	10	10	11	12	13	13	14	15	16	16	17	18	18

TABLE II —To Measure Ceilings for Paper

Measurement round room ft	*No of pieces*	Measurement round room ft	*No of pieces*	Measurement round room ft	No of pieces	Measurement round room ft	*No of pieces*
20	1	40	2	60	4	80	8
24	1	42	3	62	5	82	8
26	1	44	3	64	5	86	9
28	1	46	3	66	5	88	9
30	2	48	3	68	6	90	10
32	2	52	4	70	6	92	10
34	2	54	4	74	7	96	11
36	2	56	4	76	7	98	11
38	2	58	4	78	7	100	12

evenly distributed, such as stars and rosettes

(4) Plaids, checks, or criss-cross patterns
(5) Florals and chintzes
(6) Damasks and tapestries.
(7) Abstract and geometrical forms
(8) Period papers
(9) Imitation textures, leathers, woods, marbles, stone, plaster, and tiles.
(10) Scenic papers
(11) Borders, stilings, and friezes
(12) Appliqué and cut-out motifs

Art of Selection

Before giving any suggestions which may prove useful in selecting the most suitable paper for the *various kinds of jobs, it is im*portant for the decorator paper-hanger to remember that wall-paper literally "clothes" the wall and, apart altogether from its utilitarian purpose, can make or mar a room Furthermore, it is the only decorative medium which can reproduce every type of surface or texture economically Everything depends on right selection

Decoratively, *it is the back*ground for the furnishings of the room it can "pull a room together," it can be indicative of the taste—good or otherwise—of the person responsible for the selection

Though it has been quoted over and over again the advice of *William Morris in his lecture on* "The Lesser Arts of Life' is worth repeating He insists that . "whatever you have in your rooms, think first of the walls, for they are that which makes your house and *home* "

Colour, texture, design, style, and serviceability, plus good workmanship, are all vital to success in wall paper work Is the colour of the paper selected suitable to the amount and quality of light in the room? Is it in harmony with the other colours in the room? Are the colour values correct, whether clear, bright, or greyed tones? Do they suit the individuality and preference of the client? If texture papers are selected, then, is the scale and character of the texture appropriate to the particular type of room, and its use? The design selected should also be governed by the suitability as regards scale and type

Remember that often your client *may be utterly confused by the* array of designs and colours from which she has to choose in the *several pattern-books* usually sent out for her choice, and it should be the aim of every decorator to guide her through this array to the right choice This is always best done in the room to be decorated, but if it must be done away, then the problem is to ascertain from her all the basic facts such as size, type, exposure, and purpose of the room

To do this successfully a three-point view of the problem must be taken colour, texture, and design, and to the right decoration, suitability of colour, texture, and design should be added style—that is, whether the paper needs *panelling*, bordering or the addition of motifs

Another chapter in this book *deals with colour, but too much* insistence cannot be placed on its prime importance Everything else may be right—right size, right design, and right type of texture or finish, yet if the colour is wrong the *whole background of the room will* never give satisfaction

If colours are to be matched exactly it is essential to have a

sample, and never to depend on your client carrying the colour "in her head" When you have no sample to guide you, then it is advisable to suggest a polychrome or complementary colour Two useful principles to bear in mind are

(1) Wall-paper backgrounds should be less intense in general colour than the objects which are to appear against them in any decorative way, and its corollary

(2) That the larger the colour area, the less intense it should be, the smaller the area, the more intense may be the colour

Fitness for Purpose

Texture or emboss should be appropriate to the style and character of the furniture and to the room's use, the heavier texture effects being used for dining-rooms and halls and staircases, and with oak, rather than for drawing-rooms and with, say, satinwood

Where "period" work is concerned this is of definite importance, the type of background and style of design varying with each of the great periods satinwood and beech or mahogany being associated with Sheraton, Chippendale Hepplewhite, and Adam, and damasks, brocades moirés, multicolour stripes, satins and jaspés all very appropriate for the background Leathers the rough texture effects flocks, heavier-textured damasks, and tapestries are more suited to the Jacobean, Tudor, and Elizabethan periods, and used accordingly

Scale in design should also be understood the relation in size of shapes to each other and to the whole In small rooms large-scale designs are inappropriate and tend further to dwarf the room; but here, again, much depends on strength of tonal value

Roughly speaking, there are four types of design

(1) Conventional — usually geometrical in treatment

(2) Naturalistic—giving a realistic interpretation of scenes, flowers, birds, or foliage

(3) Stylised designs, which adopt naturalistic forms to decorative purposes

(4) Abstract designs

Each of the first three groups have been used in various historic design periods, and though present-day interpretations are seldom identical copies, but rather renderings of the feeling of the period in colour, scale, and design suitable to to-day's interiors, it is essential for the decorator to know the basic period designs, and to be able to recognise which of the various periods may be used for the job in hand

Even with so called "modern" work there is the need to be familiar with the latest trends, to enable one to achieve successfully a harmonious or correlated scheme by the right choice of wall paper

Vital Factor

Walter Crane, in his *Ideals of Art* aptly says

> "Relationship is of course, the essential in all decoration, otherwise it becomes a patchwork of conflicting pattern and colour It matters not what our materials may be, or by what means, costly or simple, we seek to obtain our effect—whether by painting, carving gilding and rich textiles, metal or plaster

work, stamped leather or wall-paper, stencilling, tiles and plain painting or stained wood and whitewash—all must be in keeping and seem fit and in its right place and proportion, and suitable to its conditions and surroundings '

Whether drawing rooms music-rooms, halls, living rooms, bed rooms, or studies are in question or whether we are considering plain papers and borders, patterned papers and stilings, or all-over designs, it is essential that the furnishings of the particular apartment should be properly considered in relation to the choice of background

The function of the room should be considered, its method of lighting its architectural features and general immediate surroundings Some rooms are required to give the feeling of rest and quietness, others gaiety and motion A dining room for instance, should look a suitable place to eat in, a living room to live in with a refined quiet and otherwise pleasing atmosphere Bed rooms should be restful and light

Easy on the Eye

Be assured that if the wall paper scheme in the dining room is so insistent that it is disturbing while you eat it is wrong in selection if the lines and motifs in the living room wall paper are worrying and unrestful it is in bad taste, or if the wall paper in the bedroom is so riotous in colour and full of movement as to give anything but an atmosphere of repose and contentment, it, also is in bad taste

As to the methods of treatment of wall papers, they can be as varied as the ingenuity of the decorator can devise If a plain or textured paper is to be used, it may call for a border, and this can be treated in a variety of ways The border can be used to make each wall one large panel, or each wall into a series of carefully proportioned panels Or again, the border may be placed below the picture rail, or with a second, the same distance above the skirting board

Use of Stiling

If a patterned paper is selected, the room may call for a stiling the width of which will be determined by the type of filling design and the size of the apartment

It is in this province that we can do with paper what cannot be done so well with plain paint The too lofty room may be apparently lowered, the low ceiling raised, the narrow room made to appear wider and the room that is too wide narrowed

As a rule, panelling, whether by stile or border, is not suitable for irregularly shaped rooms, or for the room crowded with furniture It will further dwarf a small room, but proves most successful in drawing-rooms and bedrooms Staircases also are not so well adapted for panelling

In the selection of suitable papers for panelling purposes it must be remembered that the most pleasing effects are to be had with simple designs and colourings Unless the filling is quite plain the stiling should be plain save at the edges In all panelling work it is imperative that the decorator is acquainted with the intended disposition of the furniture

But giving far greater scope to

the enterprising decorator, are the appliqué papers which are to be found in nearly all manufacturers' sets to-day These may be in single motifs, or in sets from which a decorative scheme can be built up to suit the particular requirements of the client, the various wall flanks and disposition of the room furnishings

With this type of decoration, however, a common mistake made by both decorator and client is to use too many of the motifs in the room This particularly applies to hand printed motifs, where the characteristic effect of individual handwork is entirely cancelled out by the mechanical repetition of any one particular motif

"Companion" Papers

There is a vogue to-day for "companion" papers, that is, papers which can be linked up either because they harmonise in design and colour, or have been so produced that the ground of the design is available by *itself for* use with a patterned paper

It has already been emphasised that the walls represent the background for pictures, furniture, and people, and should be considered as such Unless the wall paper treatment of a room is in perfect accord with the general furnishings and decorative scheme, that room will fail to express harmony

Studied Selection

A carelessly selected wall paper can mar the most pleasing apartment, can bring gloom into the best lighted room, and further dwarf the already too small room, whereas a dark room can be considerably lightened by a bright, clean, coloured paper, and the smallness corrected by selecting a plain or semi-plain paper instead of a dark or aggressively-patterned one The walls should look "comfortable," be "easy on the eye", unassertive and in good taste, they should be "friendly"

Individual Problems

Each type of room should have its own particular type of wall-paper Each house, in fact, presents a different decorative problem, and it is essential to remember that the selection of the wall paper should reflect the tastes of your clients, not of friends of theirs, nor the taste of the decorator, *always* primary consideration should be given to the personalities you are dealing with

Where the choice of the paper is left to the decorator, especially for an unfurnished house, he should play for safety and select unobtrusive or neutral backgrounds such as semi plains or polychromes, linking up choice of paper selected with the paint scheme, tiles, or character of the room and type of house

And remember, texture, scale, and type are as important as colour, for they introduce a play of light and shade to the walls and added interest There is a world of difference between the delicate papers, the grass cloths and, say, the plastic effects, each of which again looks different when matt or gloss finished

But conditions vary so greatly, and are never quite the same for any two rooms that it is almost impossible to lay down any hard and fast rules regarding the choice of a wall paper

A knowledge of the basic principles of design is indispensable to

the decorator paper-hanger; without it no decorative problem can be solved If a "period" room is involved, then the wall-paper, if patterned, should be of the same period or allied period, in order not only to avoid anachronisms, but to secure harmony of character.

Some Considerations

The light, delicate detail of Adam work, for instance, calls for a paper which presents the characteristic Adam motifs silk stripes, moirés, or if there is heavy woodwork with rich mouldings and ornament, a wall-paper of equal richness and dignity is needed

The size of the room must be taken into account Remember that the pattern looks larger in the pattern-book than it will on the wall Then, again, the wall paper treatment can effect some striking changes in the apparent size of the room horizontal lines such as dado or picture rails or borders tending to lower the height of the room, and vertical stripes heightening it

Think, too, that you are the artist colouring the walls, but with wall paper, and just as an artist would take into consideration in any composition the source of light, so the decorator should consider the aspect of the house, or the nature of the windows and the source of light A useful maxim to employ is to follow the light—light colours where there is ample light, and rich full colours where the light is less dominant

Rooms with a northerly aspect receive only the cold light reflected from the sky, and therefore a bright, cheerful, and sunny wall-paper is required to make up for the lack of sunshine, a tinted ceiling, too, is especially helpful for such rooms Rooms with a south aspect can take the colder colours such as blue and grey; whilst those rooms that face east and west and receive sunlight during part of the day may have papers that lie between the extremes of colouring

Adjoining rooms, too, should harmonise, or at least be linked up with one another, there should be a definite "feeling" about all the apartments which reveals the taste of the occupants and the character of the house

Again, rooms which are used by the family, such as a dining-room, living-room, and library, should express the character of the group, whilst the room of an individual should have the character of the individual whose room it is a boy's room—as a boy's room; a young girl's room with just simple decorations rather than a heavy and sombre paper

Again, the wall paper decorations for a town house would be altogether unsuitable for a country cottage, and this applies alike not only to the wall paper, but also to choice and use of borders, stilings, friezes, or appliqué cut-out motifs

Scallop-edged borders are best on plain or semi plain papers, so are straight-edged floral borders, just as patterned papers can take the stiling with the plain centre, and straight-line borders, and with stilings, friezes, or borders, depth as well as style and colour must be appropriate for the paper on which they are eventually to sit

Wall-paper Adhesives

Flour Paste Largely on account of convenience, as well as the difficulty so many paper-hangers seem to have in mixing paste, there are now many ready made pastes

and paste powders available, some of which are prepared with cold water and others with boiling water. The majority of these are reliable, especially the known proprietary pastes, and so is the "tub" paste sold by the usual suppliers of wall-paper, but the best paste is made in the bucket from good wheat flour

In making this, be sure that the bucket is clean; put in a quartern ($3\frac{1}{2}$ lb) of the flour and pour in enough cold water to mix the flour into a smooth slack batter and entirely free from lumps Now slowly pour in about a gallon of *boiling water*, mixing as you pour and continuing to mix until the paste thickens When the mixture has cooled and almost set, pour a cup of cold water over the top of the paste to prevent it skimming.

Right Consistency

The foregoing quantities will make a heavy paste, too thick for brushing, and before it can be used it will need thinning down with cold water to the consistency of thick cream, or just thick enough for pasting easily and smoothly The mixing is best done with the hands or with a flat spatula—the advantage of the hands being that any lumps can be felt and dealt with

Some paper-hangers add alum to their paste, but it is quite unnecessary and, in fact, will ruin any paper with a metallic printing, whilst others always add dextrin, no matter what weight of paper is to be hung

Starch Paste Ordinary laundry starch is used for papers which are very light and delicate, and many craftsmen use it for the white ceiling papers Take about half a pound of the starch and mix it to a smooth paste, with cold water, the consistency of syrup Pour in slowly, as for flour paste, about a gallon of boiling water, stirring all the time, and put aside to cool ready for use

Dextrin For Lincrusta work, particularly for fixing the strappings and borders on to the Lincrusta ground, and for certain other heavier or relief materials, a stickier adhesive is essential, and dextrin paste powder is recommended When mixed with cold water it makes a stiff gummy paste, too thick to apply with a brush, and should be spread with a broad knife or flat piece of wood, leaving a fairly thick film on the surface to be fixed Only small quantities should be made up at a time: it will improve in sticking quality if allowed to stand for several hours

For hanging Lincrusta fillings, dextrin should be mixed with ordinary paper-hangers' paste and *not* used "neat", though for the borders, slats, and reliefs applied to the surface of the Lincrusta fillings, "neat" dextrin is recommended

Preparation of Walls Nowadays, it is very unusual to re-paper on top of existing old papers; for one thing, it is always unhygienic to cover up dirt, and stripping the walls does guarantee sanitation; further, it ensures a better and more satisfactory job

Stripping Hints

The secret of stripping is thorough soaking of the old paper with plenty of water applied by a worn washing-off brush The paper *must* be well soaked If this is done, then it is a very simple operation to remove the various layers Impatience in waiting for the paper to become very wet or saturated

results not only in double or treble the time in scraping, but involves digging into the plaster, which entails more labour and time for repairs to the wall.

The broad chisel knife or paper-hanger's scraper used to remove the paper should be kept only about two-thirds under the paper immediately being taken off. By having part of the blade on the old paper it helps to keep the blade from digging into the walls (Fig. 2).

Washing the Walls

Frequently, there will be jobs where the old papers have been on for so long that the paste has rotted, and where this is so it is a simple matter to pull or literally peel them off, but even so, the walls will still have to be washed to remove the old paste and odd bits of paper.

If several thicknesses of paper are on the wall, hot water will prove most effective, using the scraper to remove the sodden top paper, and then re-soaking the remaining layers, using the sponge and chamois frequently to prevent water from damaging the skirting, floor, or other woodwork.

Varnished papers to be removed invariably need special treatment, and there are several well known proprietary materials for such work, for ordinary wall-paper as well as for those that have been varnished. These are brushed on to the paper in the same way as water, taking small areas at a time, they do not harm the plaster or raise the grain of wood, and are harmless to eyes, skin, and clothing.

All the foregoing methods have, however, been superseded by the Lightning stripper, a most useful invention which is easy to use, to carry, and will effectively take off any number of layers of paper, varnished or unvarnished, Anaglypta, and even plastic paints.

The machine generates steam by means of a fuel-fed burner working under air pressure, the steam being taken by a flexible hose direct to the concentrator, from which it escapes through a number of small perforations. The concentrator, held in one hand against the paper or material to be removed, allows the steam to penetrate the surface decoration and instantly dissolves the adhesive by which it is held. Its complete removal afterwards with a stripping knife is but a matter of a few seconds.

Distempered Walls. It is always advisable to wash off thoroughly walls and ceilings which have been distempered, otherwise the paper will eventually lift and come off.

For this work, an old distemper brush, sponge, broad knife, and a pail of warm water are all that are needed, besides steps and plank and a drop-sheet for the floor. Start at the top of each wall flank, well drenching with the warm water as much of the wall surface as can be dealt with at a time.

If an ordinary distemper has been used, well soaking the surface and then sponging off will remove it, but if an oil-bound water paint such as Duresco or Durolave is to be dealt with, then the scraper will have to be employed in addition to the water and cutting down of the wall surface with a coarse waterproof flint-sandpaper.

Removing Distemper

Washing off distemper is at best a messy job, and it is essential, therefore, to do the removing by as clean a method as possible, paying particular attention to the

sponging off of any of the sodden distemper which finds its way on to the woodwork or floor Further, special attention should be given to the angles and corners, where usually distemper is thicker

Painted Walls Paper hung on a painted wall which has not previously been prepared will not "stay put and eventually will peel off the paint having stopped up the porosity of the wall surface The paste will merely dry on the surface and crumble, and it is not enough to lick the surface over with a thin coat of size it must be cut down to provide a key' for the paste The walls should be washed with a solution of sugar soap or weak soda water and rubbed down with a coarse pumice block or with waterproof sandpaper, or a fine wire brush

Fig 2. Showing angle to hold a paper hanger s stripping knife which will prevent it digging into the wall

Some craftsmen prefer merely to use the coarse pumice block and very weak size water, allowing the work to dry, and then dusting off any little nibs or gritty particles Others make ready the surface by giving it one or two applications of a solution made of silicate of soda and water in the proportion of about two ounces to every gallon of water afterwards cutting down the surface with a medium grade sandpaper and applying a very weak size, and then hanging an ordinary lining paper horizontally ready for the ultimate paper which is to be hung

A recent innovation which has proved successful in the treatment of painted and varnished walls is to dust the wall down and hang a thin lining paper horizontally, that is,

in the opposite direction to the final paper, using thin paste Then, when the lining paper is quite dry, apply a liberal coating of cellulose clear lacquer This medium infiltrates the paper, also the paint below it, softening it and forming an adhesive compound

Repairing Walls The making good of all surface defects, such as nail holes, cracks, and joints between woodwork and walls, is essential to the production of good work Any very bad ceiling or wall cracks may need the expert attention of a plasterer, but for the ordinary run of work the paper-hanger will have to make good the walls

Small holes and cracks are best repaired with Alabastine or Keene's cement mixed with water on a palette board (Fig 3) to form a stiff paste, but the larger ones will have to be cut out—that is, cut away under the surface edge of the crack so that the edges will slant and make the shape of a '\,' thus enabling the filler to wedge itself in and not drop out later

Stopping Tools

Use the ordinary stopping knife for plain straightforward cracks but for those which bulge, or are higher on one side than the other it will be necessary to cut back slightly the higher surface and coarse sandpaper it to level it up before the papering is attempted

It may also be necessary, after some large surface cracks have been stopped, to "feather line" them further to ease down any unevenness which may still exist This is done by pasting a sufficiently wide length of lining paper along the run of the crack, leaving the edges of the lining free of paste, and pasting the rest of the strip with an irregular edge after the lining paper is dry, tearing off the unpasted edges and then sand-papering the whole down with fine sandpaper

Very badly cracked ceilings are best lined with an extra stout lining paper or plain Anaglypta, after first dealing with the cracks as already described for general wall work

Trimming Most paper-hangers nowadays trim on the board, using one of the patent hand trimmers or the Ridgely trimmer but many still prefer the scissors—usually turning a pair of steps down sideways as a seat, unrolling the roll of paper on their outstretched legs and scissoring it with one hand while rolling with the other, and it is surprising how speedily and accurately an experienced man will trim in this way Whichever method is preferred, the young craftsman should be thoroughly trained in the use of the scissors (Fig 4)

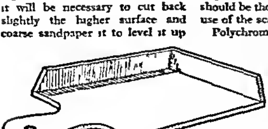


Fig 3. Useful palette board for stopping purposes.

Polychromes the majority of plain papers canvas effects and particularly hand made stipples should be trimmed well in at both edges often as much as one inch, but the amount can be determined only by examining the

Fig 4. Trimming wall papers by hand Although most paper-hangers nowadays use one or other of the patent trimmers, all beginners should endeavour to become proficient in using scissors for trimming

paper Trimming plain or semi-plain papers well in should not be considered wasteful, often, makers insert in rolls such instructions as "This paper should be trimmed well in" To disregard such ad vice through misguided ideas of economy is to court trouble with the *joins*

Though it is more usual to "dry trim' papers, nevertheless many paper-hangers prefer to trim the paper after pasting the lengths, believing that it is speedier With this method a sharp knife, accuracy of register, firm pressure on the straight edge and directness in cutting are all vital, because of the natural tendency of the pasted paper to slip and give a torn edge.

Keeping Floor Tidy

Though it may seem an insignificant instruction, it is important do not leave the trimmings or cuttings lying about the floor,

particularly those that are pasted

Lincrusta, Anaglypta and Tynecastle and other reliefs should be trimmed to the fine guide line by using the knife steel straight-edge, and the strip of zinc taking the greatest care in cutting the edges straight, and slightly undercutting them to ensure a good joint Care must be taken in trimming hollow back relief materials such as Anaglypta and Tynecastle not to press the relief too much so as to flatten it

Most of the Anaglypta adaptable *ornaments are supplied trimmed* and fitted ready for fixing though probably some slight adjustments *may be necessary to fit the various* size panels Tynecastle designs in bold relief are so modelled as to give an irregular scribing line thus avoiding cuts through features

Trimming by Wheel

Tekko leathers and metallised papers are all best trimmed with the wheel making sure that it is frequently re sharpened

Flocks, which must be cut and handled very carefully should be trimmed with the knife and *straight-edge before pasting If the* paper is dark grounded, the edges should be coloured

First of all pause and think about the job in hand the best way of working where you intend to start the hanging and to make the breaks. If it is a patterned paper study the de*sign to make sure* which is the right way up and to determine where the pattern should be cut so that the repeat or chief motif is complete and comes right at the top of the length

There is no excuse for cutting up the design just anyhow or anywhere it is neither fair to the client nor the designer of the paper and besides indifferent cutting invariably ruins the finished effect of a design completely,

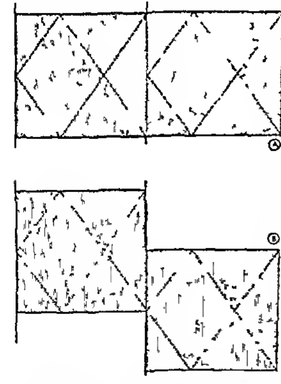


Fig 5. Illustrating a drop repeat At (A) is shown an incorrect matching and (B) the correct method

when a little time and thought could so easily have prevented this If, for instance, there are large bird motifs in the design, what could possibly look worse than a row of birds under the cornice or picture rail with their heads lopped off?

Watching the Repeat

Then, again, attention should be given to centring the design for this, the chimney breast is usually taken as the starting place The repetition of most wall paper designs, however, is based on the drop, and the paper-hanger has to drop the lengths one-half, one-third, or one sixth of the depth of the design as the case may be when hanging it, to secure the proper effect of the design

If the paper is what is known as a "straight," "set," or "horizontal" repeat, then the length on the chimney breast can be centred, whereas with a drop repeat the length is worked either side of a centre line (Fig 5)

Since the construction of most satisfactory wall paper patterns is on a basis of geometrical figures, the paper-hanger should be quite certain of the "repeat" of the design before cutting any lengths

Cutting Lengths

Having settled these preliminaries and determined the best place for light and convenience of working to set up the paste board and trestles, the required lengths should next be cut, if for lining work, measuring each wall flank, and for the wall paper, from cornice or picture rail to skirting, allowing sufficient either end of the length for final scissoring and, of course, taking into consideration the nature and repeat of the design being used

A useful tip for measuring the first length is to open out the roll on the table and lay the steel straight-edge across the paper at right angles and about a couple of inches above the portion of the design which will come at the top of the wall space under the cornice or picture rail, and then, by a sharp tear upwards and towards you, ripping the paper across (Fig 6) From this point measure the actual length required, leaving the extra inches already referred to This first length then serves as a guide for cutting the others

Arranging Edges

Turn them over face downwards on to the pasting table, arranging that all edges are level, and placing the lengths now ready for pasting about four or five inches away from the front edge of the table The lengths should be so placed that equal portions overhang at either end of the table The top length is then pulled forward so that its edge very slightly overlaps the front edge of the board, at the same time pulling the length to the left, so that its left hand corner is level with the left hand corner of the table (Fig 7)

In pasting, paste the half farthest away from you first, and spread the paste from right to left evenly and quickly in sweeping diagonal strokes (Fig 8) Keep the paste off the under length, lift the back edge of the length being pasted with the left hand and brush the paste on to the edge without letting it get under it and on to the patterned surface (Fig 9) Now complete the pasting of the front portion of the length, similarly, slightly lift the front edge to prevent any paste from getting on to the board below it It is wise

Fig 6. Having previously set up the table *in the most convenient position* for working a roll of the paper should be opened out and a steel straight-edge *laid across it at right-angles, about 2 in.* above the portion of the design which will come at the top of the wall space under the picture rail Then the paper is torn sharply upwards and inwards.

Fig 7. Top length of paper on the board is arranged for pasting by pu ling it forward so that its edge very slightly overlaps the front of the table and to the left so that it aligns with the side of the table.

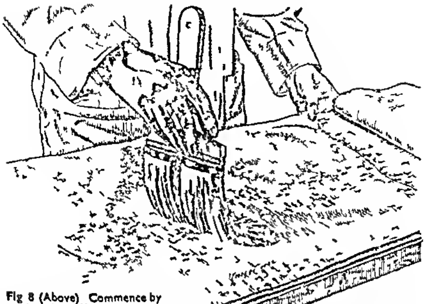


Fig 8 (Above) Commence by pasting the half of the paper farthest away and spread the paste evenly over the surface, from right to left and sweeping the brush in diagonal strokes

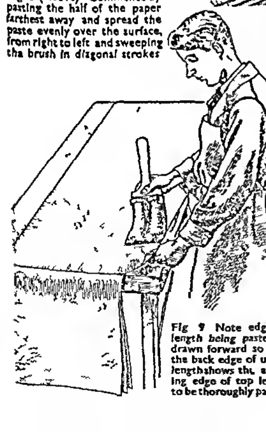


Fig 9 Note edge of *length being pasted* is drawn forward so that the back edge of under length shows thus allowing edge of top length to be thoroughly pasted

to leave about an inch or so of the length unpasted for ease of handling

Now lift this unpasted end by taking the *near corner between* the thumb and forefinger of the left hand and the back corner between the *thumb and forefinger* of the right hand gently and evenly lift the pasted paper upwards and fold the pasted portion down evenly on to itself taking care to see that the edges are level—an important detail The small unpasted portion by which the length has been held should be turned back ready for handling when the actual hanging starts This folded

length can be folded again, but it must be carefully handled

Proceed to paste the remainder of the length in the same manner already described and, *after* having done so, fold it over on to itself by taking the right hand corner between the right forefinger and thumb and the back corner between the left forefinger and thumb

Folding Lengths

Folding pasted lengths in this way is an essential knack and will be acquired only by the exercise of much patience and practice (Fig 10) Incidentally, a very useful little tip for keeping the handle of the paste brush clean and free of paste is to tie a piece of string across the paste bucket it affords a support for the brush as well as a scraper to free it of too much paste

The length which has been pasted as described can now be lifted and put aside, and the next length on the board pasted in the same way, put aside, and the third length pasted The paper is now ready for the actual hanging

It has already been decided where the work is to commence The steps have been put in position, and you have, in the large pocket of your apron, scissors, cloth, smoothing roller, and smoothing brush. Now, with the first *folded* and pasted length on your left arm, mount the steps and, gripping the small folded-back portion which you left unpasted, and holding the length in position, let the folded portion gently drop Tentatively fasten the top portion of the length, whilst making sure that it is absolutely vertical either *by plumbing it*, or *by* bringing the trimmed edge up to a chalk line *which you have already* marked on the wall

With the smoothing brush brush downwards through the centre with direct long sweeps and then from left to right with short sharp strokes and as you do so, come down the steps, all the while unfolding the remainder of the length

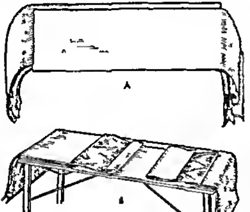


Fig 10. (A) shows length to be pasted brought to *front edge of pasting board (as in Fig 7) Folding* of a pasted length is seen at (B) while (C) shows the folding of a long length for ceiling work.

and smoothing it out with the brush. There will be several inches at the bottom to trim: let this come down over the top of the skirting board and, with the back of the scissors, run along the paper to get the correct measurement, lift the paper, and then through the marking thus made as neatly as possible cut off the unwanted portion with the scissors.

The length now fits exactly at the bottom, and all that is needed is to be sure that you have well brushed or smoothed it down. The surplus at the top is dealt with in the same way, and the work is ready for the next length. This is hung in the same way, excepting that the edge of the first length will be the fixing guide. You have already studied the paper and know where and how to match up the design you fix your second length accordingly and proceed exactly as with the first length, and so on with the pasting and hanging until the whole job is completed (Figs 11 and 12).

Fig. 11. Length being trimmed after scribing the width of paper required with the point of scissors.

Rolling Seams

The seam roller should be used after two or three lengths have been hung, but with great care, otherwise the seams will be polished and thus very noticeable—quite the opposite of the effect at which you should aim

Ceiling Papers. First of all, see that steps and plank are placed right steps at a slight angle for ease of getting up and down, and plank at a height allowing about eight or nine inches between head and ceiling To avoid unnecessary getting up and down from the plank, make sure, before you commence hanging, that you have all the tools on hand which are essential to the job

According to the shape and size of the room and its natural light, you will have to determine where to commence hanging Most paper-hangers work away from the light,

that is, with the lengths hung parallel to the window wall but some prefer to run the lengths at right angles to this wall, or to take the chimney breast as the governing factor and to strike a line at right angles to this particular point

Centring and Squaring

The walls of so many rooms however are out of square and it is therefore advisable particularly with a patterned paper to strike the diagonals of the ceiling to get the dead centre and also to strike lines at right angles to the wall passing through the centre thus obtained

If there is a central lighting fixture then a line passing through the pendant block will have to be marked out on the ceiling this should be in the same direction as the lengths of paper are to be hung and papering should be away from either side of this line These lines should be snapped by the use of the chalk line, to make them more 'readable some paper hangers use coloured chalks

Assuming that you are hanging a *patterned paper*, and have decided the direction of the lengths and intend working from a centre point determine and cut the number of lengths of paper required prepare and paste them in the usual way As ceiling lengths are invariably longer

WIPING OFF PASTE FROM WOODWORK

Fig 12. Using a sponge before finally brushing or smoothing the paper in position

HANGING CEILING PAPER

Fig 13. Fixing the end of the length of paper in pos tion is the f rst step in the process of hanging a ceil ng paper Note the margin left for trimming

than lengths required for walls and much more difficult to handle the pasted lengths will need to be folded concertina fashion and be piled on the table so that the last pasted fold is at the top (Fig 10c)

Handling Pasted Paper

Taking a part roll in the left hand place it upon the centre of the folded paper and slip the palm of the right band under the bottom of the folded pile quickly turn ng the whole over so that the p le is now supported by the part roll and carry the pile up on to the plank

Fit the top fold to the line marked on the ceiling as a guide and brush down the first portion of the length which has now been unfolded and moving along the plank to the left brush the rest of the length into position sweeping the brush away from the part roll Trim the ends as for ordinary wall paper, that is mark them with the back of the scissors pull down and trim them and brush back again into position

The next length is then hung using the edge of the first length as the guide and of course taking care to match the pattern Proceed until the cornice or wall is reached The last lengths that is those finishing with one edge against the cornice or wall will most probably be only a part of a width and will therefore need to be measured and trimmed on the pasteboard leaving an inch or so extra for final marking out and trimming on the ceiling for more often than not there are

Fig 14. Supporting the length with part roll of paper at the same time fixing the rest of length in position

The main things with ceiling work are confidence and direct, clean workmanship, to keep the paper straight and free from wrinkles, not to use too stiff a smoothing brush, but rather a soft and wide one, and then not to use it too hard or vigorously

As so many rooms are out of square it is always worth while to give careful preliminary thought to planning a patterned ceiling paper, particularly one with a large repeat design. Endeavour to equalise the paper all round If one of the walls is out of square, then work to the others that are square and let the pattern come as it will on the one that is out

slight irregularities or unevenness of line with cornice and ceiling angles

If a semi plain or small pattern only is to be hung then it is not *essential to begin in the centre*, the work could commence from the window wall Where a chimney breast is chosen as the starting point, it is usual to strike a line on the ceiling continuing that of the breast projection and to hang the edge of the first length to that line leaving the areas either side of the breast to be papered after the pasted lengths have been hung

Hanging Lincrusta The preparation of the *walls is the same* as for all other paper hanging work Though not always essential because *the material already has a* brown paper backing nevertheless *it is general to brown-line the walls*, especially when dealing with old walls or those tending to crumble, or which are badly cracked

Lumps and Bumps

Remember that in dealing with wood effects any small piece of grit left on the wall will look bigger when covered with the Lincrusta and since the finished result is

intended to give the effect of actual wood panelling, all such bumps will mar its success Therefore, proper attention should be given to the preparation of the wall surface by the use of sandpaper and dusting brush

Great care should be taken with the trimming of the material, using a sharp-bladed knife (and keeping it well sharpened) and a steel straight-edge, cutting the material on the zinc strip and, to ensure a good joint, undercutting the edge by slightly inclining the knife to the right so as to give the cut a slight bevel away from and under the outer surface

Sponging with Water

After the material has been cut into the necessary lengths and, of course, the scheme planned and laid out, not more than two or three of the lengths should be sponged at the back with water (hot, preferably, if the weather is very cold) and allowed to soak until they will absorb no more water, any surplus being mopped off

The paste, already described, should be spread on as thickly as possible and should be entirely free from lumps The first length is then fixed The length should be pressed out and away from the centre with a padded smoothing roller or a cloth The remaining pasted lengths should then be hung A further two or three lengths are pasted and hung and so on special care being taken to sponge or wipe off any paste which may have oozed out of the butted joints, or which may be on the top surface of the material This is absolutely vital especially for the modern flush panelling work where the joints are butted and left exposed

Many decorators give the brown-lined walls a quick, thin licking of paste prior to hanging the pasted Lincrusta On no account should the Lincrusta be sized, either before or after hanging

If the lengths have to be folded, then care must be taken not to crack the material by bending the folds too sharply

Planned Lay-out

Where a panelling or slatted scheme is to be dealt with, it is advisable to have a scaled detailed sketch plan showing the lay-out and from which measurements can be taken for the positioning of the actual strapping or slats, or stiles and rails as they are also called The ground should first be fixed over the whole wall surface and the joints so arranged that they will be covered by the superimposed strappings

Experience alone will enable the craftsman to plan the scheme so as to avoid wasting the material A useful tip, and one which will avoid the possibility of errors in marking out the widths of the strappings is to cut a small piece of the strapping and use it instead of a rule

Dextrin Paste

The best adhesive for fixing the slats is a pure dextrin paste, applied by means of a broad knife, leaving a fairly thick film on the surface to be fixed to the wall, then pressing the strapping or border well home Any paste which is squeezed out in the process should be immediately sponged off otherwise it will interfere with the scumbled or stained finish

Besides the plain wood grounds and their respective range of slats, there are several ready-panelled

wood effects, sold either by the piece or yard, all of which can be made to look even more effective and deeper in relief by careful staining and wiping off after fixing is finished

Considerable thought and ingenuity are called for on the part of the paper-hanger to scheme these prepared panelled designs so as to avoid finishing up either end of the wall flank with part of a panel

Too much haste in commencing the job without due forethought may be costly in the long run, and disappointment can be avoided by always giving careful thought to the job in hand before actually cutting and pasting the lengths

Concerning Lincrusta

Lincrusta is obtainable either in plain light buff or putty grounds, or decorated ways If the plain material is used and has to be painted or stained, it must in no circumstances be sized Thin coats of paint or stain, well brushed out, should be applied direct and care taken to preserve the relief of the ornament, and in the case of paint, keeping the first coat fairly sharp

Hanging Grass cloths Remember that this material is simply a woven ' cloth of grass pasted on a paper backing Because of this it needs special care in pasting and handling otherwise the paste will soak through and the backing of the material become loose, causing the grass to slide away from the backing

It can be trimmed dry, or immediately after pasting, but if left for some time after pasting it may be found difficult to trim it successfully

As it is rare to find two rolls of grass-cloth exactly alike in shade, the careful paper-hanger will take pains to examine the rolls and sort the shades, grading them carefully so that the difference in shade will be barely noticeable

Handling Grass-cloth

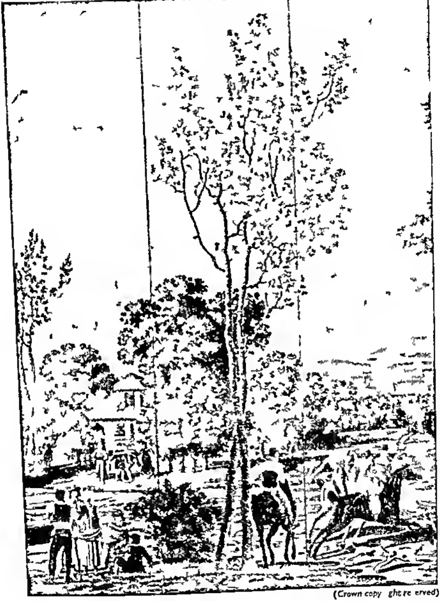
Thin paste only should be used, spread quickly and evenly The smoothing brush should be used with wide strokes, working out from the centre and towards the top and bottom first and then to either edge, the joints being rolled down with the roller, or harder cloth-covered seam roller Once the grass-cloth has been fixed on the wall it should not be touched again until it is perfectly dry, then any loose threads that may show on the surface may be trimmed off quite easily

If enrichments are desired, narrow decorated mouldings are the most suitable and effective; failing these, then simple stencilled borders worked direct on to the material

Hanging Tekko The preparation of the walls is the same as for all other paper hanging work Again, the walls should be exceptionally smooth, sized, and lined carefully with lining paper, a tinted lining corresponding to the colour of the material to go over it. Lining papers are obtainable in a variety of weights and colours

If the lining paper is too light or not sufficiently corresponding in colour to the Tekko being hung then a band of distemper colour as nearly like the colour of the Tekko should be painted on the lining paper where the joints of the various lengths of Tekko will occur, for the material when hung is apt to draw apart and, unless

PLATE IX



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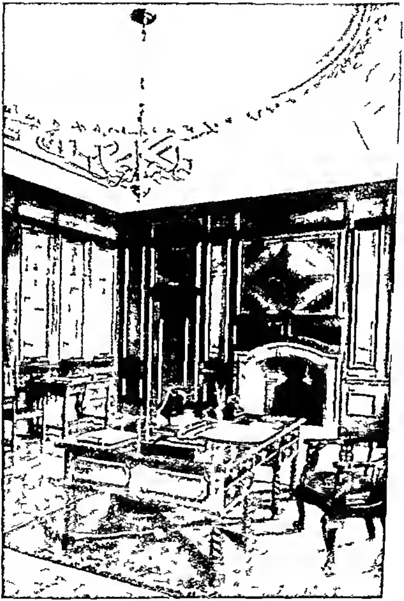
NON REPEATING SCENIC WALL PAPER

One of the most interesting wall papers of the earlier periods was the scenic which showed no repeat but formed a continuous picture all round the room This development was probably inspired by the Chinese and became very popular in France at the beginning of the nineteenth century The one shown above a copy of which is in the Victoria and Albert Museum London was printed in distemper colours It depicts all the scenes of a stag hunt in a series of full length panels



PANELLED ROOM AT SOUTH AFRICA HOUSE

Example to be seen in London of fine veneers suppl ed by James Latham Ltd for rich panelling in inter or decorat on Room is used by the H gh Comm ss oner for South Afr ca and the photo comes from the Timber Development Association

this precaution is taken, the joints will show

Remember, Tekko is made to look like woven silk, and real silk, when it is hung on the wall, is stretched taut on frames Therefore, any irregularities or bumps left in the surface will cause a small hill or rising on the surface of the Tekko and pick up the light and be apparent to anyone

Tekko should be trimmed before pasting and, unless it is old stock and, therefore, brittle, can be pasted and folded in the usual way The joints should be butted and pressed down very carefully with the covered smoothing roller For smoothing out the lengths against the wall, a clean, soft piece of dry cloth should be used instead of the smoothing brush Any spots of paste on the surface should be immediately sponged off

Furniture Gimps

Though there is a range of simple borderings for dressing or finishing the decorative effect of this material, from a decorative standpoint it is better to select an actual narrow furniture gimp and to fix it with gimp pins

Realwood Panelling The preparation for Realwood is the same as for any other decorative material The dry mounting process is recommended as the quickest and most satisfactory method of hanging all Realwood panels, especially all thick substance panels, as it obviates the use of any moisture and enables the rails to be fixed immediately the panels have been rolled down

The panels should be coated on the back with the solution and left in a warm, dry atmosphere about two hours before being mounted

Mark out the position for the panels on to the already lined wall, and cut them to size Proceed to coat the wall with the solution, using a clean old brush or a damp cloth, making sure that no portions are missed When the milkiness of the solution has disappeared (twenty to forty minutes), the panels can then be mounted

Smoothing Brush

This is done by holding the panel at right angles to the wall, carefully placing the edge of the panel down the line previously marked, then rubbing it gently but firmly, working up and down, allowing the panel to go back to the wall Finally, rub down the whole panel well with the smoothing brush

As adhesion is immediate, it is important that you do not let any two surfaces come into contact until you are absolutely sure they are in the right position

If paste is used for fixing the panels it should be strong, and the addition of dextrin or Venice turpentine is necessary A good liquid glue such as Croid is recommended for fixing the rails, cappings, etc Only a thin coating is necessary, and it should be applied with a glue brush or sash tool Whatever glue is used it should never be liquefied over a naked flame as this burns the glue and spoils its adhesive qualities and makes it useless

Liquefying Glue

The tin containing the glue should be immersed in hot water until the glue has become liquid enough for easy brushing It is usual to coat several rails at a time and allow them to stand until the glue has become just tacky, before

placing them in position The makers of Realwood issue a comprehensive booklet, and the paper-hanger should secure a copy of this through the merchant from whom he usually secures his wall paper materials

Burlaps and Canvas Both backed and light weight canvases may be cut, trimmed, and pasted the same as for ordinary wall-paper, the well known varieties being specially prepared for use by decorators, but with ordinary unsized burlap or coarse canvas of extra width the material is handled dry, the wall being pasted and the canvas rolled on to it

Cutting Lengths

A stiff tacky paste should be used heavy enough to carry the weight of the material Cut the lengths slightly longer than required and roll each length, when ready for hanging, on a stick or roller as long as the material is wide

Mount the steps with it and gradually let the canvas unroll until the bottom is reached Then, starting at the top, with a clean stiff brush evenly and firmly brush the material out, making sure to push it well down into any angles Bottoms should be marked and trimmed as for wall paper

Butting Joints

In rolling the next length on to the wall let it slightly overlap the first, smooth out this length as already described and then, with a clean steel straight-edge place the edge over the overlapped joint and, with a sharp knife cut through the two thicknesses at once In this way—and in this way only—will a perfect butt joint be possible The join thus made should be carefully rolled down with the seam roller, putting a length of soft clean rag between it and the canvas, to avoid possibility of polishing the edges of the canvas

The leading manufacturers' pattern-books contain not only a series of "companion" papers, but there is a stiling border, decoration, frieze, or simple straight-line border to fit practically every paper

With ordinary straight-run border work there should be no difficulty Scalloped-edge cut-out friezes and borders are usually obtainable ready perforated these should always be pasted intact with the waste paper, and only separated when actually ready to place into position Narrow, straight-edged borders are often better kept about ½ to 1½ in away from the cornice, picture rail, or skirting according to the width of the particular border, by so doing they are more effectively 'wedded' to the filling on which they sit

Stiling Borders

Stiling borders are mitred at the corners If a patterned paper is to be stiled, then the arrangement for the subdivisions of the wall should be marked out and the patterned paper planned accordingly for the panels (Fig 15)

It is difficult within the limits of one chapter to say much about the principles which govern not only the actual selection of the paper in colour, design, and texture, but also choice of border or stiling and the subdivision of the wall by them Besides the fixed elements in the room such as doors, windows built-in fitments mantelpiece and such other features the arrangement of the furniture in the room must be

known and taken into account

Remember the walls of a room are bounded by lines and these lines are basic in its design any lines added to them must harmonise with them The more subdivisions there are in the wall surface the less unity is achieved Endeavour to approximate the panelling arrangements of opposite walls The size and style of borders and stilings must be related to the size and character of the room as well as to the filling paper

Fig 15 Plumbing and fixing a stiling upright

Positioning

If appliqué or cut out decorations are to be hung it is always advisable to secure positioning directions from the manufacturers and in any event it is better to pin these up first before pasting them down to enable all the factors which should govern the positioning to be taken into consideration

The majority of appliqué motifs are printed on the same paper as that on which they are intended to s t and quite often this has a directional texture The motif must be fixed so that its texture corresponds with the direction of the filling texture Unless there is a bounding cut-out line to the motifs it is inadvisable to use them for any other than the ground on which they are printed for instead of looking as they are intended to look they will appear as ill drawn lumps and the effect intended will be entirely ruined

Some Failures

This chapter would be incomplete without a word concerning unsatisfactory results and how to avoid them and the novice would

be well advised to study them and act on the advice proffered

The more frequent causes for dissatisfaction can be enumerated under three main headings as follows

(1) Bad joints
(2) Papers drying out with a patchy appearance
(3) Shadiness

Causes of Trouble

Although it is not possible to deal in detail with the reasons for all such troubles, it can truly be said in regard to those which come under (1) and (2) that they are generally the result of one, or a combination, of the following. (*a*) Too much friction in making the joins, due to rolling down too heavily, or flogging into position, using the brush too vigorously, or over handling (*b*) Too weak an adhesive (*c*) Over-soaking with paste (*d*) A too-strongly sized wall (*e*) Hanging directly on a painted or non porous wall surface

So far as (3) is concerned, this may be due to (*a*) Failing to reverse alternate lengths (*b*) Insufficient attention by the paper-hanger in shading out the rolls (*c*) Not working from one roll at a time or according to rotation numbers

To the experienced craftsman all these factors are well known, yet often, in a desire to get the job done quickly, they are overlooked, with consequent unsatisfactory work and disappointment to the client

It should be obvious from these few brief details that the decorator or paper-hanger who desires to take pride in his work should always study local conditions applying to the job, and guard against the above-mentioned factors By so doing he will obviate many of the more common defects in good paper-hanging and thus enhance his own reputation

Finally, we may sum up by reiterating the importance of cleanliness of working hands, tools, and equipment, and by emphasising the following points

(1) Trimming implements must be well sharpened and in good working order
(2) *Thoroughly prepare* the surface of walls.
(3) Proper pasting of material with the right kind of paste is essential
(4) Give preliminary thought to the planning and setting out of the job to be done, study the pattern If a pattern is involved, position, match, and make sure design is right way up
(5) Avoid waste of material and time, but skimp neither Remember that each new task successfully achieved adds to that skill and efficiency in paper-hanging which can be acquired only by experience

The decorator will be confronted by the question as to the respective merits of wall-paper as against paint and distemper It is a fact that wall-paper, when properly applied, may be satisfactorily used on almost every type of surface, including new walls

The main advantages in the use of wall papers are (1) The great variety in colour, texture, and pattern, (2) their proved wearing qualities and ability to absorb and disperse moisture, (3) ability to cover irregularities in plaster wall surfaces, both new and old, (4) ease of removal, (5) adaptation to various *panelled and decorative effects*

CHAPTER XII

MEASURING, ESTIMATING, AND SPECIFICATIONS

METHODS OF MEASURING ESTIMATING MATERIALS ESTIMATING TIME COSTING UP OVERHEAD EXPENSES HOW TO READ A SPECIFICATION EXAMPLES OF SPECIFICATIONS SPRAY PAINTING COSTS PAINTERS' BOOK-KEEPING BOOKS REQUIRED PROFIT AND LOSS ACCOUNT FLUCTUATIONS OF COSTS WORKMEN'S TIME SHEETS AND MATERIALS SHEETS ESTIMATING SPECIAL PROCESSES

THE following list outlines the factors necessary to ensure a reasonable return to the master craftsman for time, skill, and money put into a painting and decorating business

(1) A full understanding of all the practical craft processes
(2) Knowing how to measure areas
(3) Having the ability to estimate quantities of material, length of time a job will take, and the difficulties to be overcome in working
(4) Having a full knowledge of the cost of material, labour, and overhead charges
(5) Being able to understand specifications and to cost up work from them
(6) Keeping accounts books properly
(7) Having a 'hard head'—the harder the better

Varying Estimates

It must be clearly understood at the beginning that rarely will two firms send in the same price for a job The difference to the contractor is often astonishing and to the customer beyond comprehension A variation of £350 in an £800 job is commonly found

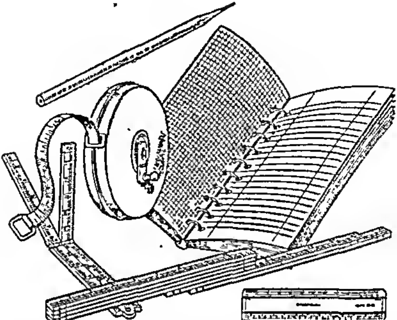
Firms differ very much in their method of assessing the value of the finished work, and quite a few have no method at all Differences may arise through one firm buying larger quantities of material than another, or, in one case, the specification might have been misread, or a room missed in measuring Errors can occur in pricing or the estimation of workmen's time

Good Book-keeping

A good estimator understands every detail of the work involved to produce any desired finish and, over a period of years will accumulate a vast store of references in his note books which will save him hours of work

These books should be carefully kept, as they form the basis of a firm's costing They probably began with carefully calculated areas which later have been used as guides for buildings similar in form or size An experienced estimator can fairly closely assess the price for a job without detailed calculations

A professional costing clerk, as employed by some firms is not a craftsman and is, therefore, less likely to be influenced by personal contact with customers, his prices



MEASUREMENTS NEED TO BE ACCURATELY TAKEN

Fig. 1. Knowledge of geometrical principles is invaluable to the decorator. He will need several instruments, which may be added to as work becomes more exacting

being based on a set scale of yardage costs. Large contractors adopt this method

Some organisations have a set of prices which their members are all supposed to use, in which the yardage costs of a fair range of different processes are included

Keeping Accounts

The law has to be considered and taxes are based on the firm's books, therefore, correct accounts must be kept of all transactions These books should also show the financial position of the firm at any time.

Some of the more artistic or specialised processes are very difficult to cost and, sometimes, a price is set, for instance, a certain number of books of gold-leaf are specified, instead of stating that a certain area is to be gilded.

It is also necessary to state in the estimate *the cost per gallon* of some materials Copal varnish, for example, varies considerably in price per gallon with different types and manufacturers

It is the practice of town councils, and other bodies letting large contracts, to supply complete sets of areas with the details of coats of paint and treatment These are taken off plans by the surveyors' departments, but it is advisable for the serious estimator to examine the job, that is, if it is already built

Measuring must be simple, quick, and accurate. It is done

with the 2- or 3 ft folding rule, the yard stick, metal or wood strip extension rod, or the box tape (Fig 1)

The measurements are shown in the book in square yards, as this is the standard of calculation for painted work, and materials are advertised by manufacturers to cover stated numbers of square yards or yards super to the gallon

Surfaces to be measured conform to one or other of the shapes shown in Fig 2 and the surface areas of these are calculated as follows

Rectangle = length × breadth = 21 sq yd

Triangle = $\frac{1}{2}$ base × height = 24 sq yd

Circle = square of radius × $3\frac{1}{7}$ $=\frac{36}{1}\times\frac{22}{7}=113\frac{1}{7}$ sq yd

Sphere = square of diameter × $3\frac{1}{7}$ $=\frac{81}{1}\times\frac{22}{7}=254\frac{4}{7}$ sq yd

Cone surface = $3\frac{1}{7}$ × diam × slant height $=\frac{22}{7}\times\frac{8}{1}\times\frac{12}{1}=301\frac{5}{7}$ sq yd

Cylinder = circumference of base × height = 25 × 20 = 500 sq yd

Ellipse = major × minor axis × $\frac{4}{5}$ $=\frac{8}{1}\times\frac{9}{1}\times\frac{4}{8}=43\frac{1}{8}$ sq yd

If the measurements are taken in feet divide the answer by 9 to give square yards, for example $12\frac{1}{4}\times21\frac{3}{4}$ ft $=\frac{49}{4}\times\frac{87}{4}=266\frac{7}{16}\div9=30$ sq yd (approx)

Entering Measurements

As the work is measured it is entered into a note book which may be ruled as shown in Table 1

A simple sketch of the room could be made with measurements written as in Fig 3

Some explanation of the results shown in the areas column is necessary

Ceiling Shown in square yards

Cornice In foot run, which is a usual method of measuring for pricing work in length such as skirtings gutters, fall pipes, beadings and strip of various kinds charged at so much a foot run

Walls Area shown in square yards The area of two doors and one window and fireplace having been deducted from the total wall yardage

Doors It is usual to add a little

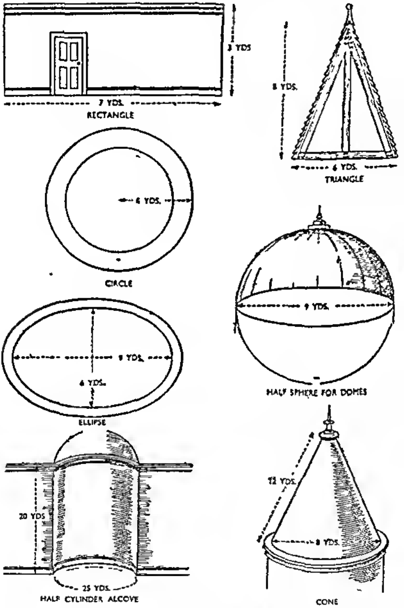
TABLE I—MEASUREMENTS TABULATED

Job Name

Address

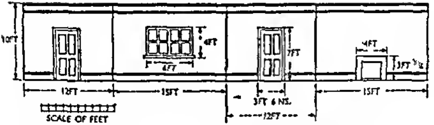
Folio No Date

Position	Surface	Measurements ft	Areas
No 1 bedroom	Ceiling	15×12	20 sq yd
	Cornice	54×1	54 ft run
Top floor	Walls	54×10	48 sq yd
	2 Doors	7×3½	5⅓ yd
	1 Window (8 pane)	6×4	4 sq yd
	Skirting	54×¾	54 ft run



MEASURING SURFACE AREAS OF VARIOUS SHAPES

Fig 2. Above are illustrated the various shapes of surfaces encountered when making measurements for an estimate. See page 327 for calculating methods.



ROUGH SKETCH OF ROOM, WITH MEASUREMENTS

Fig 3. A sketch of the room should be made on squared paper and the relevant measurements entered upon it Other particulars should be entered in a note book and include the skirtings ceilings mouldings and details common to most rooms

to the net area of a door and casing to make up for the mouldings

Window To the 24 sq ft has been added half that amount Windows are measured overall and a portion added according to the amount of cutting in necessary

Skirting Shown in foot run

The note-book should *contain* pages ruled in squares to show square yards and square feet, so that areas of an unusual shape may be calculated more easily

Running Tape Round

Mouldings *are measured* by running the tape round all the shapes It is surprising the area a heavy moulding contains it can then be priced per foot run lineal yard or by square yard

Measuring should commence at the top of the *building, working* each floor down to the basement, and finishing with the staircase and hall

In each room measure in this order ceiling, cornice, frieze, walls, woodwork, and then any special features Show doors and windows as single items and say how many

When measuring the exterior of buildings, take all high measurements from the inside where possible The height of a building may be measured by dropping a tape from a top window or the roof or by measuring one section of a rain-water pipe and counting the number to the top

Gutters are shown in foot run and doubled to compensate for ladder work Rain-water pipes are calculated by girth measurement and *priced* at so *much per foot run* Painted stucco exteriors are measured by width multiplied by height and a percentage added for any surface elaboration

There are two methods of taking measurements from an architect's plan

(1) Use a scale rule, and measure each portion with the same scale as shown on the plan, say, ⅛ in to 1 ft

(2) Draw, on a sheet of tracing paper, squares representing square yards to *the same scale* as the plans Place this squared paper over the parts to be measured and count up the square yards they contain

Calculating Tables

Calculating tables are invaluable to those taking measurements They save time and are used by all costing experts There is a table for *every* conceivable type of measurement and reckoning and they give accurate results They can be

bought cheaply at any architects' suppliers or stationers

Estimating means assessing or judging the amount of

(1) Preparation a surface will need to produce a desired finish.
(2) Time craftsmen will be employed in doing the work
(3) Material a job will take
(4) Scaffolding and tools to be used and difficulties to be overcome

A basis on which to work out quantities of material may be formed by making a list on the lines of Table II Most estimators memorise a very long list of this kind

The paint is calculated as for wood surfaces, first coat, the second coat will take one-third less Double the area for ironwork

Ready for Use

It is the modern practice for painting materials to be marketed in ready for use form, but some paints are still made up by the craftsman In such a case the base, vehicle drier, and thinner are calculated from a set basis (Table III)

This gives an idea of the proportion for general use on surfaces other than metal Adjustments must, of course be made in the vehicle and thinner according to the amount of gloss required and the porosity of the surfaces

Ready - made - up paints are usually specified by the makers to

TABLE II.—Showing Quantities of Materials

Material	Surface covered (approx.) sq. yd.	Per weight or gallon
Flat oil paint	115	gal.
Durable gloss paint	80	gal.
Water paint	700	cwt. paste
Varnish	90	gal.
Enamel	110	gal.
White lead paint	40	28 lb.
Zinc oxide	45	28 lb.
Venetian red	50	10 lb.
Glazes	250	10 lb.
English wallpaper	7	1 rod

cover a stated area and as there are a limitless number of different types of surfaces which can be painted, practical experience is the best guide For a porous surface, usually the addition of one-third to one half to the normal amount will be a correct adjustment.

Paint thinly brushed on or thinned down too much will cover more surface, of course, but if an architect specifies three coats of paint he sometimes states the proportion of oil or turps to be added, such as 3 parts of raw linseed oil to 1 part turps—1st coat, 2 parts of raw linseed oil to 1 part turps—2nd coat, thin with turpentine only—3rd coat

Stains and glazes cover a much greater area as shown in the list of surfaces and materials Materials for mural painting can be set at only a price to work to as this type of work is not priced per yard super Estimating time is one of the

TABLE III—Basis for Making up Paint

Sq yd	Coat	White lead	Paste driers	Oil	Turps
500 40	1st	125 lb 10 lb	12½ lb 1 lb	3½ gal 1 qt.	3 gal ½ pt.

most difficult sections of the task Labour cost is the greatest charge against a job and it is influenced by many things Here are some of them

All men differ in their working speed, they vary even in the different classes of work, one man may cut in window sashes twice as fast as another, yet he may not be any good at work above floor level, therefore it is absolutely necessary for the estimator to know the capabilities of the staff or to allow for variation in working speed

Ill health, bad weather, lack of interest, or difficult working conditions must be reckoned with

Helpful Hints

The following suggestions may help the master craftsman

(1) Allow set times for painting normal items, *i.e.* doors, windows, skirtings, or hanging rolls of wall-paper
(2) Work out the time for each part of the work and do not guess a total time for a whole job
(3) Consider the ability of the men to be employed and if possible, select a group capable of doing a job in the desired time
(4) Consider whether the surfaces of walls, woodwork, or metal will add to the craftsman's difficulties
(5) Add time for work which necessitates climbing steps, ladders, or scaffolding and the handling of such tackle
(6) Note the possibilities of over time or extra help
(7) Consult the craftsman who is to do the work if it involves an unusual treatment or needs special care in its execution

Time for the preparation of surfaces is difficult to judge, and all work should be seen and, if possible, tried, to discover if there is any part of the surface which will employ more time than usual For instance, a door may look perfectly solid, yet when the old paint is burned off the painter finds the woodwork cracked and broken to such an extent that some hours extra work are necessary for filling

Old wall paper often hides yards of cracked plasterwork Time and not material is the main charge, as can be seen from the following list of processes Dusting, washing down, stripping wall paper, rubbing down woodwork, burning off paint knotting sandpapering, cleaning iron railings and gutters

Quite often a price per yard is set by the firm for all these items of preparation and charged alike on all jobs

At this stage it is necessary to introduce the money aspect so that we may work out examples and cost up specifications Jobs are usually let by day work or contract ' in the painting industry

Charging Day Work

"Day work ' is priced on the completion of the work by charging for time taken and material used on the job plus overhead percentage

Contract ' work is measured up, estimated and costed, a price is then submitted

Each method has its advantages and experience is required to prepare a competitive price The things which have to be charged come under the following headings (1) Workmen s time, (2) materials, (3) trade charges, (4) overhead expenses (5) profit

(1) *The workman s time* is charg-d

to the customer at a set figure per hour, most of which the workman receives and a small proportion goes to the firm

(2) *Materials* are bought in quantities (Table IV) as large as the firm's business will permit, because a bulk purchase works out much cheaper than the cost of small amounts

TABLE IV—MATERIALS AND QUANTITIES

Material	How sold
Flat oil paint	Gal
White lead (paste)	Cwt
Varnish	Gal
Linseed oil	Gals or cwt at 9 lb per gal
Turpentine	Gals or cwt at 8½ lb per gal
Enamels	Gal
Size	Bulk or lb
Sandpaper	Quires
Gold leaf	Books of 25 leaves
Wall paper	Per roll or piece (Normally 12 yd by 21 in)
Brushes	Singly or per doz

A list of this kind may be extended to include a great range of materials and the painting contractor will keep the price lists of many manufacturers for reference

(3) *Trade charges* include wear and tear of scaffolding travelling expenses brushes carting and any other item which is a necessary part of the actual work It should also include wages of persons spending time on the job in advisory and organising capacities At least 10 to 15 per cent is added to each job for this purpose

(4) *Overhead expenses* These vary tremendously according to the standing of the firm but in *most cases they include such* things as all the expenses of the office all rates and taxes and insurance, salaries

By experience over a number of *years a firm can set a figure which* they may add as a percentage on each job It would be unwise to state a definite figure to charge in all circumstances as the expenses *of each business will differ so much.*

Adding Overheads

The usual method of finding a working addition for overheads is *to discover what percentage of the* turnover is represented by all the running expenses thus Turnover, £5 500, overheads £850

Overheads represent about 15½ per cent of the turnover in this example

Additions and replacements must be made in staff and equipment of the office and must be anticipated when fixing a figure for this cost

Estimating Profit

Profit is another variable item and it depends on the return expected for money invested in the business and the amount to be set aside for improving it Profit is made by wise estimating control of waste in time and material skilled handling of contracts and correct buying

The appliances necessary for painting and decorating are divided into two groups that supplied by the operative for his own use, and the equipment supplied by the firm

The operative painter provides himself with a kit of tools which usually *includes the following* 2½-in paper scraper shave hook,

1-in chisel knife, hammer, putty knife, papering roller, 11-in papering scissors, plum-bob and chalk line, set graining combs, cutting knife

This is not very expensive compared with that needed in some other trades It can, however, be extended to include all kinds of gadgets which the man may seldom use

The employer provides the following items, and as they are all likely to wear out, the trade charge must be so set to anticipate their replacement distemper brushes, varnish brushes, turks' heads, dusting brushes, stipplers, flat wall brushes, paper-hanger's brushes, stencil brushes, paint brushes, fitch for lining and cutting-in, signwriting pencils, graining mottlers

Brushes Supplied

A kit of brushes is usually issued by the firm to each operative painter and he is responsible for their condition and must return each worn-out brush to be replaced Brushes are a costly item and a big job may cost quite an appreciable amount in this respect

An indication of the other plant which the firm must possess may be gathered from the following list, but it will be understood that it does not indicate all the equipment needed for every job

Planks, trestles step and pin ladders, extension ladders, roof ladders paste table and trestles, burning off lamps, paper trimmers, steam strippers, spray painting equipment, ladder brackets, ropes scaffolding poles, Rap-rig or steel tube hand cart gilding equipment, dust sheets, buckets, paint cans, strainers, etc

This list will show how urgent it is to keep a paper record of money spent on tools and equipment, and review the position often so that a large enough trade charge is made The cost of a lorry, van, or car must be charged to cover initial outlay and upkeep

Prime and Job Cost

We can now measure a job, estimate the materials required and their cost, judge the amount to be charged for time, and the trade charges, overheads, and profits There are two terms in general use in the trade. Prime Cost and Job Cost

Prime Cost means the estimated cost of all the materials and time If you add to this the percentage for trade charges, the result is the Job Cost To this total, the overhead charges and profit will be added

The specification sets down in precise terms the details of all work required to be done It may be prepared by an architect, a clerk of works, a master painter, or other qualified person It is the contractor's business to be able to interpret properly the wording contained therein, so that every part of the work is priced for its correct preparation and treatment

Legally Binding

Nothing must be missed, because if a price is accepted for a job based on a set specification it is legally binding on the contractor to fulfil the requirements stated therein The architect may, if he desires, compel the contractor to strip off and repaint large areas which have not been carried out to specification at the contractor's expense

One Type of Specification in Use For the painting and decorating of

THE NEW CHAPEL
GREEN ROAD, MELBEY
March 20th

General Conditions

(1) The work will be done under contract between the successful contractor and the Trustees

(2) All preparatory work must be carried out in a manner which will give the most satisfactory surface for a good finish

(3) All parts of the building and fitments not to be treated must be covered up or protected during the work, and left in good condition on completion

(4) The contractor shall provide everything necessary, including scaffolding and equipment, for the proper execution of the work

(5) Extra work will be paid for if authorised in writing by the architect or clerk of works

(6) The contractor must provide cover by insurance against possible accident, damage, or third party claims

(7) Defects appearing within three months after completion and proved to be caused by the use of inferior materials or workmanship may have to be made good by the contractor

(8) The decoration will be completed in accordance with the colour sketch and designs which can be viewed at the office of the Trustees

(9) The materials to be used will be brought on the job in sealed cans Genuine white lead paint thinned with ½ R O, ½ turps Crinkle Paint and Varnish Co 's Materink flat oil paint thinned in the proportion of 1 pt of raw linseed oil to 1 gal of Materink The finishing coat to be thinned in the proportion of 1 pt of genuine American turps to 1 gal of Materink Crinkle's best hard church oak varnish

(10) Skilled workmen only are to be employed

(11) The work must be finished by June 25th or a penalty of £ per day will be imposed

(12) This clause may refer to the amount of payment which the contractor can draw before the work is finished It is sometimes customary for trustees or councils to retain 10 per cent for a period of three to six months after the work has been completed

Example Estimate

It is proposed to work out an example (Fig 4), taking the illustration of a club lounge as the subject This drawing is made to scale and measurements can be taken off as though the estimator were actually in the room, the whole of which can be seen at one time

The other drawing of the same room which is made on squared paper, enables the estimator to see the actual square feet or square yards in any portion (Fig 5)

An estimate of the time cost for yardage can be worked out as follows

Preparing ceiling and making good, 10 min to 1 sq yd

Rubbing or washing down and making good painted work 10 min to 1 yd

Stripping washing down, and making good wall surface, 15 min. to 1 sq yd

Water painting ceilings 1 hr to 25 yds

Painting walls and ceilings with

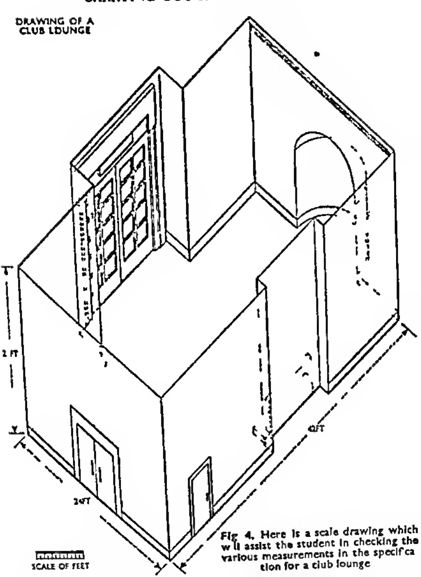


Fig 4. Here is a scale drawing which will assist the student in checking the various measurements in the specification for a club lounge

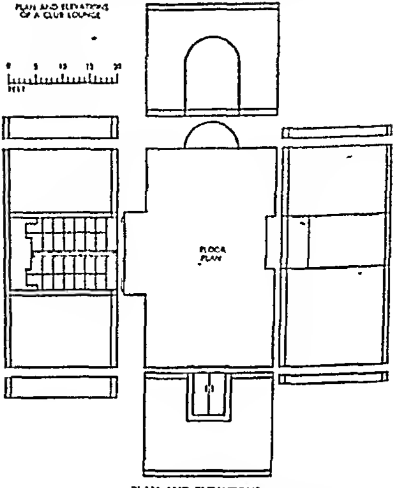
4 in wall brush 1 hr to 25 yds
Painting gloss finish woodwork 1 hr to 20 yds

The rate per square yard for material can be calculated by taking the cost per gallon and dividing by the number of square yards one gallon will cover

Multiply that figure by the yardage to be priced and the cost of the area is shown Add the time and material cost together to get the prime cost

The columns in the pricing should be Area Treatment Yardage rate for time Yardage rate for material Prime cost

Specification for a Club Lounge



PLAN AND ELEVATIONS

Fig 5. From this illustration, used in conjunction with the Fig 4 drawing the actual square feet in any particular part of the lounge can be calculated.

Ceiling Previously white water paint, slightly cracked To be washed and the broken plaster repaired, cracks raked out and made good, new plaster to be painted one coat flat oil paint The whole to be painted with two coats of an approved flat oil paint, and finished cream Area of the ceiling, etc :

	sq ft.
Ceiling area, 42×24 ft .	=1008
Window bay, 16×4 ft .	= 64
	1072
Minus chimney breast, 10×1½ ft. .	15
Divide by 9 to get sq yd .	9)1057
Total (sq yd) . .	$117\frac{4}{9}$

Cornice Condition as ceiling Prepare as ceiling and paint two coats flat oil paint finished in two selected tints Cornice area

Distance round the room	.	143 ft × 1 ft
Second tint	.	143 ft × 4 in

Walls Previously papered and in moderate condition To be stripped thoroughly, washed down, and left smooth Make good broken plaster as ceiling Paint with three coats of an approved flat oil paint, the first coat to be thinned with 1 pt of raw linseed oil to the gal, second coat to be thinned with ½ pt raw linseed oil and the rest turps The final coat to be thinned with turps only Finish pale grey buff, glaze, and mottle with apple green and pale coral colour Area of walls

Distance round room		143 ft.
Multiply by height	.	21
		3003 sq ft

Deduct

		sq ft
Area of doors, $7\frac{1}{2} \times 6$ ft	=	45
,, ,, 7×3 ft	=	21
Area of window, 20×14 ft	=	280
Area of fireplace, 8×5 ft	=	40
Area of alcove front—		
Rectangular part, 10×10 ft	=	100
Semicircular $\frac{1}{2}$ of $3\frac{1}{7} \times$ radius squared, or $\frac{1}{2} R^2 = \frac{1}{2} \times \frac{22}{7} \times \frac{25}{1}$	=	$39\frac{2}{7}$
Total to be deducted	.	$525\frac{2}{7}$
Area to be painted	. .	3003
		$525\frac{2}{7}$
		$2477\frac{5}{7}$

To this must be added the area of the inside of the alcove calculated, thus

		sq ft
The $\frac{1}{2}$ cylinder $= \frac{1}{2} \pi D \times$ height $= \frac{1}{2} \times \frac{10}{1} \times \frac{22}{7} \times \frac{10}{1}$	=	$157\frac{1}{7}$
The $\frac{1}{4}$ sphere $= \frac{1}{4} \pi D^2 = \frac{1}{4} \times \frac{22}{7} \times \frac{100}{1}$	. =	$78\frac{4}{7}$
Area of alcove to be added		$235\frac{5}{7}$
Previous total		$2477\frac{5}{7}$
Divide by 9 to bring to sq yds		$2713\frac{3}{7}$
Total area of walls to be painted (sq yd)		$301\frac{1}{2}$

Woodwork Previously grained and varnished To be rubbed down smooth with pumice stone or waterproof abrasive paper Made good with hard stopping Painted two coats of specified undercoating, sandpapering down between coats, and finished with one coat of a high grade gloss enamel paint green grey

The doors to be spray painted with a geometric decoration in gold bronze cellulose (Fig 6)

Areas were worked out for deduction from the wall surfaces

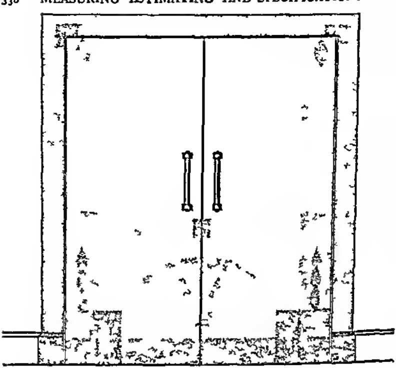
Total area of woodwork

		sq yd
Doors		$7\frac{1}{2}$
Windows		31
Skirting	. .	16
		$54\frac{1}{2}$

An Alternative Method This example will show the areas in square yards, the total time for each process, the amount of each type of material, and the cost of these details

We will use another room as representing the job

Present Condition Ceiling has



TREATMENT OF THE WOODWORK

Fig 6. Doors may be painted with a geometric decoration in gold bronze cellulose.

whitened beams stained and varnished walls green oil paint dado dark green gloss paint woodwork brush grained and varnished

Suggested Specification

Ceiling Wash off rake out all cracks and make good with plaster of Paris Paint new plaster with one coat of flat oil paint and finish with two coats of white water paint thinned with petrifying liquid only

Ceiling Beams Thoroughly wash down with a solution of weak soda and water Make good all cracks with hard stopping and paint with two coats of cream flat oil paint.

Walls Wash down as ceiling beams and make good all broken plaster paint with three coats of flat oil paint of an approved make and colour—new plaster to be painted an extra coat

Dado Prepare as walls and rub down to a smooth surface with waterproof abrasive Paint with two coats of undercoating and one coat of finishing gloss enamel paint of selected colour and make

Woodwork Rub down wet with waterproof abrasive make good with hard stopping paint with two coats of ground colour and finish in medium toned brush grained oak Varnish with one flowing coat of a full bodied inside oak varnish

The yardage is then worked out as before Ceiling flats 210 sq yd ceiling beams 157 walls, $353\frac{1}{2}$ dado 47 and woodwork, $28\frac{1}{2}$

Time worked out from guidance given earlier in the chapter.

		Hours
Preparing—		
Ceiling flats, approx 10 min. to the yd		=35
" beams " 10 " "		=26
Walls " 10 " "		=42
Dado " 10 " "		= 8
Woodwork " 15 " "		= 7
Water painting—		
Ceiling flats, 1st coat at 15 sq yd to the hour		=14
" " 2nd " 18 " " "		=12
Painting—		
Ceiling beams, 1st coat at 10 sq yd. to the hour		=16
" " 2nd " 12 " " "		=13
Walls with 4-in. wall brush at 20 sq yd to the hour, three coats		=54
Dado, 1st coat at 10 sq yd to the hour		= 5
" 2nd " 12 " " "		= 4
" gloss finish at 8 " " "		= 6
Woodwork, two coats at 6 sq yd to the hour		=10
Graining woodwork " 3 " " "		= 9
Varnishing " " 3 " " "		= 7
	Total hours	268

This represents about seventeen working days of eight hours for two men The estimator would show this time on his sheet, which would also contain the quantities of material and the estimated cost, and is for the firm's private reference

Add the firm's percentage for trade charges, including carting, scaffolding, and other incidental expenses incurred directly in carrying out the work, the firm's normal overhead percentage, and the working profit percentage

The total after these additions represents the price submitted to the client for contract purposes

Thinning Paint

One or two points need explanation It is the estimator's business to know that any paint can be thinned to cover a vast area, but a satisfactory coat depends on the consistency necessary to obliterate the existing ground colour and make a solid finish in the number of coats which are specified

Spray Painting

There are two distinct types of spray painting One is the use of heavy equipment for spraying large surfaces with water paint and flat oil paint, whitewash, and camouflage materials To arrive at a price for any of these processes needs actual experience over a period

A guide to the setting of a price can be given, as it will be found that on work which does not involve the application of pattern, time is saved but more material is used

On sprayed ironwork such as girders, roof stays, radiators, piping railings, and trellis-work, labour will cost about 25 to 33 per cent of brushing time, while the cost for material will be 20 to 30 per cent

greater Very large factory undertakings, aerodromes, and military works are to-day being painted with spray equipment On work of such vast areas it is customary for a price to be set per ten or hundred square yards by the customer The contractor merely states the percentage of profit he is prepared to work at, perhaps 15 to 25 per cent, or more

Payment by Results

The operatives or gang of men are now being paid by results on some of the spray work, though piece work is not common in the painting industry Sprayed decoration is very popular these days as it enables some choice finishes to be produced with modern materials which would be impossible by any other means

Any job, no matter how large, is made up of a number of processes which are similar to those employed in smaller work Therefore, the important thing to master is the costing of every process

If the estimator knows the cost of a square yard of four-coat work on doors or the cost of a finished door, it does not matter if the job has five hundred doors, it is no more difficult to cost than a small house

More experience will be needed to organise the work and the cost of supervision will go up as will the cost of scaffolding and transport The addition of a percentage to cover these contingencies is all that is required

It is modern practice to use ready prepared materials wherever possible This simplifies considerably the estimating of quantities of material and it fixes the cost with greater certainty

It used to be the practice to send white lead, oils, turps, driers, binders, varnishes, and a host of other items necessary to make up the paints on the job This meant extra time for mixing paint and for cleansing strainers and cans All these things add to the cost of the job

The practical operative painter and decorator has very little writing to do during the course of his employment, therefore, when he desires to set up in business for himself he finds the need for some guidance in keeping accounts

This preliminary information represents the system of book-keeping now in common use by painting firms and fulfils the requirements of the law and the accountant

As the firm grows in size, additions can be made to suit the type of business and a staff will be employed on this clerical work The various books can be bought ready ruled in the correct way, and sometimes the columns have printed headings

If the examples are studied with the explanation of their use there should be no difficulty in following the system

Workman's Time Sheets The workman is supplied with these sheets by the firm He enters the time he has worked each day the job he has been working at, and details of the actual work done. The time is entered in the Time and Wages Book

It is also entered in the book which records time and material to be charged to each job A weekly time sheet is preferred by most firms

Insurance and Wages Book This book is bought ready printed The accountant requires to see this

book It shows the hours worked, the deductions made for insurance, pension, unemployment, and income tax, and gives the net amount to be drawn for payment of wages

Job Wages and Materials Book The cost of any particular job is made up by entering the time and material in a book indexed with pages for each job

Everything relating to any one job can be found under its own heading Materials can be shown booked to it and any return credited This is necessary when painting is done by 'day work"

Material Sheets These are used by the job foreman or other responsible person for ordering materials from the shop The items are copied into the job wages and materials book

The Cash Book This is a standard type and can be bought properly ruled It shows all transactions made in cash It has two main parts the left hand side, cash received, and the right hand side, cash paid out An extension of the columns on the right gives an analysis of these payments This is an important book and must be properly kept as it has to be submitted to the accountant

Stock Book The profit made or loss sustained by a firm is made up each year, and for this purpose an annual stocktaking is necessary to show the closing stock for one year and the opening stock for the next Painting materials and fixed stock are entered up and priced at the cost price or present market value, whichever is the lower

Purchases may be recorded in two ways Statements, accounts, and receipts for payment are attached together monthly, marked alphabetically or numbered and filed away, the letter or number being entered in the cash book column headed for this purpose

The cash book shows the payment made and to whom, and the invoices may be turned up quickly by referring to the filing number The other method, *i e* the use of a ledger of accounts with different suppliers, is of more value to a large firm with long-term credit and clerical staff

The Ledger (Sales or Outward) This book is indexed, and separate pages headed for each customer It records credit accounts, indicating when the account was sent and the amount This information is entered on the Dr or left hand side When payment is made it is entered on the Cr or right-hand side, and also in the cash book as cash received An account book which records a duplicate is used to send out bills to the customers

Sale Day Book In this book should be entered all totals of the accounts and any other sales or jobs paid for in cash From this book the annual sales can be computed

Profit or Loss In a very simple way, this is how the balance is shown, assuming everything is paid up

	£		£
Opening stock	200	Sales	1 000
Purchases	450	Closing stock	250
Wages	250		
Other expenses	100		
	1 000		
Profit	250		
	£1 250		£1 250

Each section of this system can

be considerably extended Private books of a personal character may be kept An elaborate system of purchasing, issuing, and charging stock can be put into use

Partnerships and firms working as limited liability companies, require special books, yet, however extensive the system, it will be based on the one just described, which generally meets all cases

Craftsman's Skill

We started this chapter with seven sub-headings, six of which have been dealt with according to the available space The seventh mentions the hard head of the business man Part of his stock in-trade is the skill of the craftsman which should not be sacrificed for an extra pound of profits This would be poor economy

Do a good job at a proper price, and see that nothing is missed Highly finished work cannot be done cheaply, yet the amount and quality can always be adjusted to suit the price

Remember that your customer lives with the colour and decoration you produce and even the business man with the hardest head knows that a good job raises the status of the craft, and a satisfied customer is his best advertisement and investment

Summing Up

To sum up the information given in the chapter it will be noted that actual prices and costs have not been stated To set a price for any painting operation would tend to give the impression that each set of circumstances was identical and that a process should always cost the same price per yard

This is far from being correct Material prices fluctuate, the speed at which the work is produced depends upon quality desired skill and inclination of the operative, the type of firm doing the work, difficulties in accessibility surface, etc., and by no means the least important is the contractor's and the customer's conception of what is a fair price

These points have been dealt with in detail and an indication given as to their relative importance in arriving at a price

It is not always possible for the contractor to price up a job to fit the available funds, and judicious questioning of the customer may enable him to prepare a specification and price which will produce a satisfactory finish within a certain price limit Indeed an alternative price and adjusted specification is often submitted

Good Workmanship

High grade craftsmanship is always worth the extra cost but the contractor of experience understands that work of a temporary nature is quicker and cheaper to produce and helps to increase the turnover

Decorative painting of a highly artistic character is difficult to estimate and it is done in one of two ways either a sum of money is allotted to be spent on this part of the job or the designer will submit a sketch showing what can be supplied at a certain cost In each case the contractor is working to a stated price Important work of this kind is often done at "day work rates and the cost reckoned on completion

Many decorative processes (Fig 7), such as graining signwriting, broken colour, stencilling, gilding

and bronzing, colour combing and plastic paint, are carried out by operatives receiving a higher rate of payment The cost of the materials is often high and the originality and charm of finish worth a good price (Fig 8)

Graining

Graining is priced by the square yard according to the type of wood and quality of finish Some modern wood effects cost very little more than a plain job

Sign work is estimated on the basis of surface preparation, and letters charged at so much per inch, per letter, which includes all setting out, and painting the proper number of coats to make a solid job

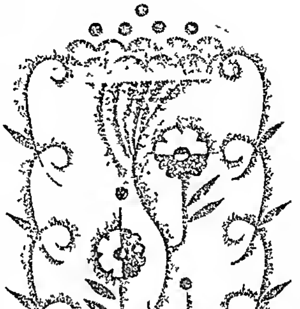


Fig 7 Spray wall decoration such as this involves cost of time for designing cutting masks, and execution of the work by craftsmen of proved ability

Stencilling prices are based on the quality of design and number of colours or plates, borders being charged per yard, and other items at so much each (Fig 9)

Gilding Processes

Estimating for gilding requires a knowledge of the many gilding processes, as there is usually waste gold in both loose and transfer gilding The amount of gold leaf can be calculated by dividing the area to be gilded by the area of a leaf of gold, 10½ sq in, or by 263 sq in, the area of gold contained in a book of twenty-five leaves Then add for waste according to the type of surface or pattern

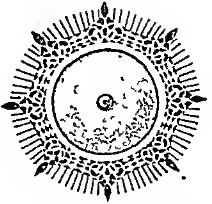
Paint manufacturers prepare and issue a complete book of specifications dealing with the correct use of their own particular products This is an extremely important point for the decorator to remember

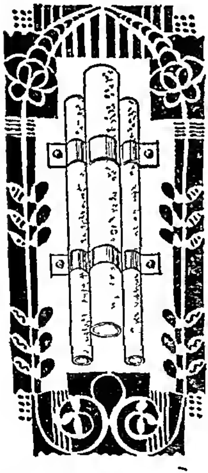
These specifications not only give the sequence of coats with

DIRECT FREE BRUSHWORK

Fig 8. Primary charge for work of this nature falls upon the cost of labour A highly skilled decorator is essential and no amount of economy can be permitted in the attaining of originality and charm of design and finish in this class of work.

Fig 9. These two illustrations are examples of work carried out with the use of stencils In this method of decorative painting the main charge falls upon the cost of designing and cutting the stencils, borders being estimated at a charge per yard, and other items at so much per design





details as to their proper consistency, but include information regarding suitable preparation of the ground Recommendations for every conceivable type of surface treatment is usually stated, and alternative materials to suit any desired quality of finish

Expert Information

The prices are shown together with a full range of colours obtainable and the contractor is thus able to offer his client expert and exact information on any phase of surface finish

It must be pointed out, however, that the information contained in the manufacturers' specifications refers to their own products only and must be used for that purpose

Experience Needed

Considerable training and skill are required to measure estimate, and specify for any branch of the painting industry No matter what aids are available, it needs experience of actual practical work over a long period to know what preparation is required for every conceivable kind of surface

If the foregoing advice is taken there will be no regrets afterwards

CHAPTER XIII

DEFECTS: CAUSES AND REMEDIES

DEFINITION OF A DEFECT COMMON DEFECTS—CAUSES, EXAMPLES, CURES BLISTERING, CRACKING, FLAKING, BLOOMING, CLOUDING, AND FOGGING CHALKING PINHOLING AND POCK MARKING LOSS OF GLOSS SURFACE STAINS BLEEDING INTERACTION BETWEEN PIGMENTS FADING CISSING FLASHING LACK OF OPACITY GELATINATION CRYSTALLISATION DEFECTS FROM FAULTY MANIPULATION DEFECTS IN PAPERED SURFACES BAD JOINTS

A DEFECT is generally defined in painting and decorating as a lack of something essential to giving complete satisfaction This condition may be the result of indifferent craftsmanship, in which case, perhaps, only the æsthetic sense registers dissatisfaction, the protection of the surface being adequate and hygienically sound On the other hand, the use of poor quality or unsuitable materials, instability of the groundwork upon which paint is applied and the incidence of severe or unusual climatic conditions may bring about deterioration and disintegration In such cases the film ceases to perform the functions which are essential to and were the reasons for its application

Responsibility for Defects

Lack of the necessary knowledge of natural forces in general and chemical combinations and reactions related to the material of the craft are responsible for many defects Manipulative skill alone is not sufficient to ensure good work, there must also be an intelligent inquiry into the reasons for an operation and for the use of certain materials for particular purposes

In the past, the schools have placed too much emphasis upon manipulation Under the new schemes now being evolved, a definite attempt is being made to correct this and to develop in the young painter the faculty for inquiry and deduction in all matters appertaining to his craft

Investigating Causes

In this chapter, an attempt is made to deal with the physical appearance of a fault or defect, with investigation of the probable causes and with faults peculiar to certain pigments in combination with media and when either or both are superimposed Measures are indicated which can be taken for the prevention and cure of such faults

Blistering After a paint or varnish film has dried hardened and rendered satisfactory service for some time, its surface is raised in the form of blisters This disfigurement may be limited in area or, in certain circumstances, may extend over the whole area.

If not subjected to mechanical damage the film retains its weather-resisting properties With ageing the raised portions of the paint or

varnish become brittle, when the slightest pressure causes their fracture, leaving circular or elliptical holes in the film This occurrence is limited to paints varnishes, and enamels having an oil medium

In all cases the cause will be found to be an elastic film enveloping some material which vaporises easily when heat is applied from either natural or artificial sources

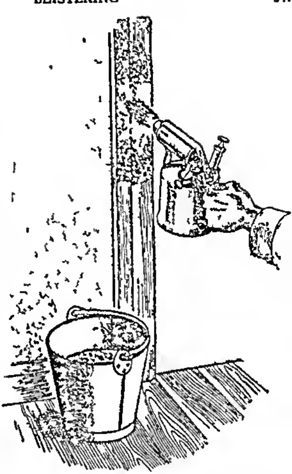


Fig I Where the surface has badly blistered it is advisable to remove the old paint by applying heat

Unseasoned Timber

One example is the application of oil paint or varnish upon the surface of unseasoned or wet timber Unseasoned timber has a considerable moisture content which prevents adequate penetration of its surface by the applied paint The incidence of external heat causes softening of the loosely attached film and vaporisation of the liquid contained in the timber The extra room required is obtained by the expansion of the elastic film in the form of blisters

Another would arise in painting or varnishing timbers which have a high resinous content as in pitch pine and other timbers near and about knots when no precautionary measures have been taken Direct sunlight or nearness to a fire softens the oil in the applied film and at the same time vaporises the spirit contained in the resin

Again the imprisonment of moisture within the film This may occur upon a previously painted surface if at the time of painting it was damp through deposited frost dew mist rain or by not being allowed adequate time for the evaporation of absorbed moisture taken up during the preparation of the surface when it was cut down with an abrasive agent and water

A final example of blistering is that due to faulty preparation of

metal surfaces, preventing uniform adhesion over the whole surface

The following precautions should be taken to prevent blistering All new timber must be dry and adequately seasoned before priming Knots and resinous portions are best removed and replaced by sound timber *Failing this they* must be isolated from the superimposed paint or varnish by a coating of resin-free knotting made from lac dissolved in commercial alcohol One thin coat should be applied in order to obtain good penetration and grip, followed by a thicker solution for insulation

Painting Pitch-pine

When painting pitch pine or other timbers, the resins of which are known to have a solvent action upon oil the whole of the surface should be washed with commercial alcohol and wiped dry with a clean rag It should be primed with paint made from the necessary pigment ground in linseed oil and reduced to a working consistency with japanner s gold size and white spirit in equal proportions The maximum grip is imparted to the film by this means The composition of all superimposed paint should vary very little from that of the priming coat

Painting should not be done early in the day or during very humid or frosty weather, when the surface may be covered by a film of condensed moisture Wiping this from the surface will not abstract the moisture which has been absorbed, this can only dry out *naturally with improved climatic* conditions

After the preparation of old *painted surfaces* by washing and rubbing down in a water medium adequate time must be allowed for drying The same applies to the slight rubbing down between coatings and after cutting down varnish and enamel before the application of a second coat.

The cure is to see that surfaces, upon which the paint has badly blistered, *normally* have the whole of the paint removed down to the groundwork, by the application of *heat* (Fig 1) or *the solvent* action of a liquid paint or varnish remover In both cases the film is softened, and removed with *stripping* knives, shave-hooks, or other appropriate tool The exposed surface is then cleaned dry by abrasive action with glass or similar grained paper and primed within a reasonable time As the surface is liable to blister the priming is kept thin and sharp or hard drying The removal of the paint by means of a water soluble alkali is not recommended, as this may render the surface more susceptible to the fault which is being corrected.

Cracking The physical appearance is such that the dry film, while still adhering firmly to the surface upon which it is applied has its surface broken by fissures These may penetrate one or several coats but seldom the whole fabric of the paint In width they vary from a hair line to one-eighth inch of the under surface exposed The fault may be localised or extend over the whole surface Its occurrence is most prevalent in paints, varnishes, and enamels with an oil medium

Causes of Cracking

The causes of this defect result from imposition of a hard drying material upon an unstable foundation or from lack of uniformity in the composition of superimposed

films All materials containing an oil which dries or solidifies by taking up oxygen are increased in bulk during the process, with ageing much of the absorbed oxygen is lost, causing contraction and alteration in the atomic structure of the material in consequence

Strong and Weak Bonds

Where the films composing the whole are similar in character and the bond or grip between each is good, the alteration in bulk takes place by a reduction in depth or thickness *only* *If, however*, a weak bond occurs through the imposition of a flexible or unstable material or lack of proper adhesion between any two films, the lateral strain exerted by the reduction in bulk is sufficient to break the upper layers into somewhat irregular fragments

Enamels, being composed of oxidised oil, are particularly prone to surface contraction and reduction in the area covered, unless the ground upon which they are applied is stable Ageing and exposure to direct sunlight frequently lead to this fault in graining glazes composed of umber (manganese) and a drying oil medium

Hard varnishes are liable to crack when used upon external painting which is normally of an oily or flexible character

Surface Contraction

The carelessness of a paperhanger in allowing paste to remain upon newly painted, varnished or enamelled work, or on surfaces subject to considerable changes in temperature, is another cause of excessive surface contraction

The normal precaution to take is to avoid the use of old fat or partially oxidised paint, particularly for priming The latter should be freshly-made paint, fluid enough to penetrate the surface deeply and when dry to leave a hard, firm surface Each film should be slightly more elastic or oily than the one upon which it is placed Follow up the coatings at reasonable intervals, allowing time for the thorough oxidation of each coat

Never paint without first cutting down the surface with fine grained abrasive paper and dusting off As a *preliminary treatment*, if there has been a long interval of time between coats, wash the surface with a weak solution of sugar soap in addition to the cutting down

Remedying Cracking

To remedy cracking, remove all cracked paint until a solid or stable foundation is obtained This can be done by painting upon its surface a proprietary brand of spirit paint remover, the active principle of which is one of the ketones, that is, alcohol in combination with an acid (Fig 2) These materials are taken up readily by the dry and aged film of oil paint or varnish with considerable increase in bulk, but the continuous skin remains In some cases this can be removed with the fingers, but it is more easily taken off with a broad knife One or several layers may come away in one operation leaving a layer which shows no signs of cracking, if not, repeat the process until an undamaged film is displayed

Cease the process at this point and allow the solvent which has been taken up by the lower layers to evaporate or dry out Then cut down the surface with an abrasive

metal surfaces, preventing uniform adhesion over the whole surface

The following precautions should be taken to prevent blistering All new timber must be dry and adequately seasoned before *priming* Knots and *resinous portions* are best removed and replaced by sound timber Failing this they must be isolated from the superimposed paint or varnish by a coating *of resin-free knotting* made from lac dissolved in commercial alcohol One thin coat should be applied in order to obtain good penetration and grip, followed by a thicker solution for insulation

Painting Pitch-pine

When painting pitch pine or other timbers the resins of which are known to have a solvent action upon oil, the whole of the surface should be washed with commercial alcohol and wiped dry with a clean rag It should be primed with paint made from the necessary pigment ground in linseed oil and reduced to a working consistency with japanner's gold-size and white spirit in equal proportions The maximum grip *is imparted* to the film by this means The composition of all superimposed paint should vary very little from that of the priming coat

Painting should not be done early in the day or during very humid or frosty weather, when the surface may be covered by a film of condensed moisture Wiping this from the surface will not abstract the moisture which has been absorbed, this can only dry out *naturally* with *improved* climatic conditions

After the preparation of old painted surfaces by washing and rubbing down in a water medium adequate time must be allowed for drying The same applies to the slight rubbing down between coatings and after cutting down varnish and enamel before the *application* of a second coat

The cure is to see that surfaces, upon which the paint has badly blistered, normally have the whole of the paint removed down to the groundwork, by the application of *heat (Fig 1)* or the *solvent* action of a liquid paint or varnish remover In both cases the film is softened, and removed with stripping knives shave-hooks, or other appropriate *tool* *The exposed* surface is then cleaned dry by abrasive action with glass or similar grained paper and primed within a reasonable time As the surface is liable to blister, the *priming is* kept thin and sharp or hard drying The removal of the paint by means of a water soluble alkali is not recommended, as this may render *the* surface more *susceptible to the* fault which is being corrected.

Cracking The physical appearance is such that the dry film, while still adhering firmly to the surface upon which *it is applied, has its* surface broken by fissures These may penetrate one or several coats but seldom the whole fabric of the paint In width they vary from a *hair-line to one-eighth* inch of the under surface exposed The fault may be localised or extend over the whole surface Its occurrence is most prevalent in paints, varnishes, and enamels with an oil medium.

Causes of Cracking

The causes *of this defect result* from imposition of a hard drying material upon an unstable foundation or from lack of uniformity in the composition of superimposed

films All materials containing an oil which dries or solidifies by taking up oxygen are increased in bulk during the process with ageing much of the absorbed oxygen is lost causing contraction and alteration in the atomic structure of the material in consequence

Strong and Weak Bonds

Where the films composing the whole are similar in character and the bond or grip between each is good, the alteration in bulk takes place by a reduction in depth or thickness only If, however, a weak bond occurs through the imposition of a flexible or unstable material or lack of proper adhesion between any two films, the lateral strain exerted by the reduction in bulk is sufficient to break the upper layers into somewhat irregular fragments

Enamels, being composed of oxidised oil, are particularly prone to surface contraction and reduction in the area covered, unless the ground upon which they are applied is stable Ageing and exposure to direct sunlight frequently lead to this fault in graining glazes composed of umber (manganese) and a drying oil medium

Hard varnishes are liable to crack when used upon external painting which is normally of an oily or flexible character

Surface Contraction

The carelessness of a paperhanger in allowing paste to remain upon newly painted, varnished or enamelled work or on surfaces subject to considerable changes in temperature is another cause of excessive surface contraction

The normal precaution to take is to avoid the use of old fat or partially oxidised paint, particularly for priming The latter should be freshly-made paint, fluid enough to penetrate the surface deeply and when dry to leave a hard, firm surface Each film should be slightly more elastic or oily than the one upon which it is placed Follow up the coatings at reasonable intervals, allowing time for the thorough oxidation of each coat

Never paint without first cutting down the surface with fine grained abrasive paper and dusting off As a preliminary treatment, if there has been a long interval of time between coats, wash the surface with a weak solution of sugar soap in addition to the cutting down

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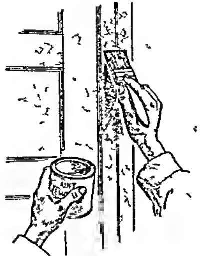


Fig 2. Cracked paint may be removed by applying a spirit paint remover

waterproof paper and white spirit and wipe it off with a clean rag It is now ready for re painting

If the cracking is very pro nounced or extends down to the original surface the whole film must be removed In such a case burning off may be the most economical method This process has been described in the chapter dealing with painting

Cutting Down Surface

There is a practice in the indus try of preparing cracked paint by cutting down the surface super ficially with an abrasive such as lump pumice stone while washing with a solution of sugar soap and cleaning with clear water The surface is left to dry and then painted with sharp colour that is paint containing rather more than the normal amount of drier and thinner When dry the fissures are filled with hard filler composed of paste white lead ground in linseed oil and dry whiting which to gether with japanner s gold-size, is worked into a stiff paste upon a hand board After slight reduction with turpentine or white spirit the filler is pressed into the hollows and all excess is removed from the surface with filling knives

Using Makeshifts

Sometimes this filler is replaced by a paste water paint stiffened with whiting In either case the painting is then proceeded with in the normal manner

Neither of these makeshifts will prove satisfactory for long as the cause of the trouble has not been removed the film which caused the mischief still forms a consider able proportion of the whole and will continue to act as before

Flaking The dry film fractures into irregular shapes Each section so formed lifts at its edges and finally falls away from the surface The flakes may be of considerable size or extremely small this depends upon the degree of fri ability peculiar to the materials from which the film is formed Normally all are exceedingly brittle The fault may occur in all types of painting but most frequently with distempers washable distempers and water paints

Flaking is caused by lack of cohesion either between ground work and applied material or between the various layers which build up the whole film This occurs when a material which dries with a hard pot like texture is placed upon an unstable ground work, when films are super imposed which have little in common in composition or in the speed at which they respond to

humidity, temperature, and vibration, when there is limited penetration of a surface by the primer or by efflorescence, that is, chemical reactions within the fabric of the surface upon which the paint films are placed

One example is the application of glue-bound distempers upon limewash Limewash dries by conversion into shell like layers somewhat brittle and only slightly keyed together Glue grips the surface upon which it solidifies and with ageing diminishes considerably in bulk The force thus developed is sufficient to cause cleavage between the lime and the ground upon which it is formed This peculiarity is utilised when limewash has to be removed, a coat of strong size is applied which, upon drying, pulls the limewash from the surface, which causes it to fall away in flakes

Sizing New Plaster

Another example is the practice of sizing new plaster and bare timber with water soluble glue or other colloidal substance, before coating it with a primer, made from the same type of pigment and media as the material which is to be superimposed for the completion of the work This not only prevents penetration of the fabric, but also inserts a film which resists penetration of its body by oily substances and, with ageing contracts to an abnormal degree by loss of evaporated water The force developed by this reduction in bulk eventually becomes more powerful than its adhesive or surface gripping qualities, hence fracture and cleavage take place

Surfaces which have been treated with glue bound distemper or covered with paper-hangings must have all traces of glue-size and paste removed before treatment with washable distemper or water paint, otherwise there will be no adequate penetration of the surface by the latter material, which differs so widely in type from the former The surface tension developed by the ageing of the shell-like film and lack of grip upon the groundwork causes its fracture and severance from the surface upon which it was placed

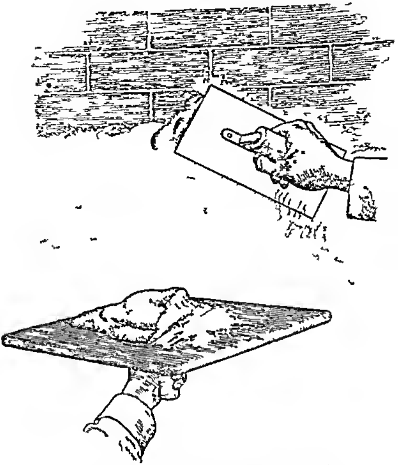
Other Flaking Troubles

The staining of floors with black japan and then varnishing them with a wood oil varnish also leads to flaking Among other ingredients, black japan contains bitumen, a material always flexible and very susceptible to changes in temperature It is made specially for use upon the ironwork of vehicles where flexibility and the ability to withstand considerable vibration are assets *It is quite unsuitable as a groundwork for wood oil varnishes*, which become solid mainly by alteration in atomic structure, and as a thin film are likely to be friable

Breaking Down

The mechanical hammering which the superimposed film receives by traffic over its surface, combined with the flexibility of the surface which carries it, provide the conditions required for its breakdown Therefore it breaks up into very minute flakes which leave the surface

Instability of groundwork may also result from the faulty preparation of painted surfaces Grease being allowed to remain upon any surface prevents the perfect adhesion of paint Any hard drying



LIME PLASTERED SURFACES SUBJECT TO FLAKING

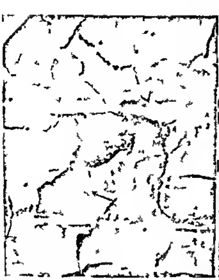
Fig 3. Efflorescence is the dry ng out of salts on plaster surfaces under favour ab e cond tions th s takes at least s x months to complete, and for this reason new surfaces shou d be left untreated for a much longer time. The plastering operation i lustrated is not a pa nter s job in fact, he is forbidden to undertake it.

paint applied upon its surface will eventually fracture and come away

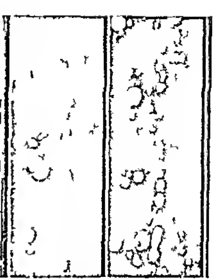
The us of size and lime as a lubricant when cutting down old surfaces for re-painting s doubly unsatisfactory unless they are thoroughly washed off with clean water It not only leaves the oil resisting glue film but also provides free lime which tends to destroy the effectiveness of the first coat of paint through action upon its oil content

Adequate adhesion is also prevented by painting and varnishing before complete evaporation of the moisture absorbed by a painted surface during preparation In

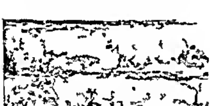
PLATE XI



Cracking and *flaking* may be caused by hard drying material applied upon an unstable ground In the above example the faulty patch covered an area of only 2 sq ft although all the walls of the room were treated in the same manner at the same time



Blistering as illustrated above was the result of painting upon resinous timber with a good quality gloss oil paint followed by exposure to direct sunlight Note that the hemispherical bulges have fallen away leaving the groundwork exposed



Efflorescence due to chemical reactions within fabric of a wall and stimulated by contact with water It may form on top or beneath paint or varnish applied to *surface* and *in* the latter case is capable of disrupting the film

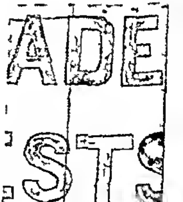
Effect of inadequate preliminary treatment of knots in woodwork to a superimposed paint film Knots should be effectively sealed so as to prevent solvent action arising before any *paint* or putty is applied to the surface

PLATE XII

Shrivelling or wrinkling brought about by contraction of the timber by seasoning after the application of paint and varnish. The condition may also be caused by a too thick elastic film being applied upon a hard ground

Contraction and fracturing of varnish and enamel upon an unstable ground is illustrated above. The cause was the use of too elastic an undercoat. Note the diminution of the area covered by the lettering in the above example

Paper hanging defects that have been caused by indifferent workmanship should be remedied and normal practice insisted on. Illustration shows careless filling of a fault in the plaster and the ridge formed by the lining having been lapped and not rubbed down before the second paper was applied



Crazing and fracturing brought on by the application of a hard drying material on elastic undercoats and fading caused by exposure to direct sunlight. The crazing on the ground is intensified down to the timber in the area of the lettering

course of time the friability of the ageing film, combined with the vibrations caused by the slamming of doors, will result in flaking from the surface

Efflorescence is the formation under certain conditions of a white crystalline deposit upon the surface of plaster It is responsible for much flaking

In theory, a lime-plastered surface consists of lime putty (quicklime slacked with clean water), cow hair, and clean well-washed sand, thoroughly mixed together in balanced proportions This is applied with trowels to the surface of brickwork or other surface prepared for its reception and worked upon until an even, tightly-packed surface is obtained (Fig 3)

Drying Out

In the process of drying, which takes at least six months to complete under favourable conditions the water evaporates and the lime links up with carbon, forming calcium carbonate evenly distributed among the particles of sand and linking them together

In practice, the slaking is frequently indifferent, so that particles of quicklime remain undigested Often the sand is not clean, if obtained from near the sea it may contain common salt and the salts of other metals The water may also contain some of these in solution

While the plaster dries these generally make known their presence by the formation upon its surface of substances in powder or crystalline form This is the reason for leaving all plaster surfaces untreated for a period of from six to twelve months, so that appropriate remedies may be applied to the surface to avoid the need for interference with its future treatment If after the lapse of twelve months a plastered surface is still in good condition, further treatment can be applied directly, providing the surface remains dry

Percolating Water

Water may make contact with the structure upon which the plaster is applied through the absence or inadequacy of damp courses, or through leaky gutters and roofs or porous external walls This will cause chemical reactions to develop within the fabric of the plaster whatever its age Such reactions will make known their presence by throwing off distemper, water paint, oil paint, or paper attached to its surface

Flaking upon ironwork is caused by the development of rust beneath the film through access to water It may develop at a considerable distance from the point of contact Upon sheet lead or lead pipes it is caused by the susceptibility of this metal to contraction and expansion with changing temperatures (Fig 4) This takes place to such an extent with the influence of heat upon the applied paint that cleavage occurs

Other metals are generally coated with a non-drying grease to prevent oxidation during storage or transit Unless this is removed by washing with white spirit and surface texturing with a coarse abrasive, no key or grip will be established for the applied paint which, with ageing, will bring many troubles

To prevent flaking, all brick, stone, plaster, timber, and metal must be dry throughout their structure and be superficially clean before the application of distemper,

water paint, oil paint, varnish, or paper upon the surface The only exception is formed by surfaces finished in Keene's and Parian cement and other hard wall plasters

These are primed with a paint made from genuine white lead ground in linseed oil, plus 5 per cent by weight of paste driers, broken up in genuine refined linseed oil and reduced to a working consistency with an equal quantity of white spirit or genuine turpentine This primer is applied to the surface as soon as the latter will stand the working of the brush Thus a firm, impenetrable ground is established upon which the painting

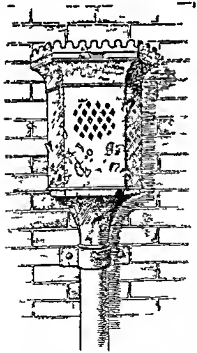


Fig 4. Flaking symptoms are common upon sheet lead or lead pipes caused directly by changing temperatures

may be completed after a reasonable time has elapsed for drying purposes.

A key or bond must be established between the surface covered and the applied material, either by penetration of that surface or by roughening it to obtain the necessary grip The slightly solvent action of the thinner in the applied paint is a valuable asset in forming a key with its ground

The sequence of coats must be from hard drying primer to elastic or flexible finish The time between coats should be sufficient for thorough oxidation but not so prolonged that they are hard dry

The surface of each layer of paint should be slightly cut down before re-coating

When Distempers Flake

Washable distempers and water paints are liable to flake with ageing if superimposed to any great depth It is therefore usual, where frequent periodic treatment is undertaken in this medium, to prepare with a thin coat of oil paint at about every fourth layer

Where efflorescence has occurred upon a plaster surface through penetration by water, the painter should search for the cause and have it corrected No superficial treatment will be of lasting benefit until this is done

The affected surface may be laid in with a solution of silicate of soda (waterglass), using large brushes, and while still wet a solution of chloride of lime is applied The whole is left to dry after which all the dry powdery substance which will have formed upon the surface is removed with glasspaper and the work dusted down with a dry brush It is now thoroughly washed with clean water

and allowed to dry (Fig 5) After the lapse of forty-eight hours, the appropriate treatment for the finish required is applied as though the plaster were new but dry

This treatment is satisfactory only if carried out properly The fabric must be dry and contact with water eliminated, the strength of the solutions of silicate of soda and chloride of lime must be balanced and adequate, and the washing must be thorough You cannot blame a treatment for breaking down if the primary condition is not fulfilled

Blooming, Clouding, and Fogging This is a whitish semi-opaque formation resembling the bloom upon ripe grapes or plums Its occurrence is mainly confined to materials made from oils which assume a solid state mainly by oxidation and dry with a bright glossy finish Dark rich colours call marked attention to this defect Enamels and full gloss oil paints may be superficially affected, but their pigmentation prevents much change in their appearance Varnish exhibits the greater disfigurement, as its transparency is interfered with to some depth

This defect arises from absorption of moisture by the drying film The moisture may have condensed upon the surface before it was coated, have been present in the fabric of the ground or have formed upon the partially dried surface from a moisture laden atmosphere owing to a marked difference in their temperatures

Conditions which may cause condensation include damp, foggy weather, or frost, cold damp, and ill ventilated premises, fumes from gas stoves and fires, and cold draughts To obviate this condition all groundwork must be superficially dry and free from any moisture absorbed during the preparation of the surface This can only be assured by allowing adequate time for natural evaporation The brushes must contain no moisture from previous washings The material used should be of the same temperature as the surface upon which it is applied This is ensured by its remaining in the vicinity of the surface, or at least in the same temperature, for some time before it is used

The work should be executed only when climatic conditions are favourable The ideal is a warm, dry, still day with temperature from 65 to 70 deg F Cold draughts should be prevented during the operation while the film is drying, but adequate ventilation should be provided

Leathering Off

In some instances the disfigurement is mainly superficial In such cases the cure is sponging with clean cold water and leathering off will remove it without liability to recur

For use where the penetration has been greater, linseed oil, commercial alcohol, and acetic acid are mixed together in equal proportions (Fig 6) This liquid is applied with a soft rag and little pressure to the surface, which is finally washed with a sponge and clean water and leathered off

If neither of these treatments effects a cure, the surface will require cutting down by the abrasive action of fine grained glass or emery paper or pumice powder and a felt pad lubricated and washed off with white spirit. It is best to avoid the use of water as a

lubricant when the material has shown a marked liability to bloom The spirit should be given time to evaporate and the ground to harden, after which the appropriate finish can be re-applied

Chalking In its most pronounced form there is a considerable lightening in tone with complete loss of gloss The pigment remains upon the surface as a powder which comes away at the slightest abrasive action It occurs chiefly with glue-bound distempers and straight oil paints Washable distempers, paints containing a reinforced oil, enamels, and varnishes are subject only to very superficial damage.

Chalking may be due to destruction of the medium or binding agent by decay, by severe climatic conditions, combination with an unsuitable pigment, or by use of an excessive quantity of drier.

Fixing Agent

The fixing agent in glue-bound distempers will decompose in contact with water unless carbolic acid or chloride of lime is also present in the material applied For all exposed situations and where the atmosphere is clean, as in the open country and particularly by the sea, the oil content of the final coating should be replaced by an elastic varnish The resins which have been incorporated with the oil reinforce it against mechanical damage by dust laden high winds and against premature disintegration through the action of clear bright sunlight

Pigments of an alkaline nature should be avoided as they are liable to form unstable compounds with the acid in the oil Many specifications include a certain percentage of

Fig 5 To remove efflorescence on plaster the surface should be thoroughly scraped dry and treated with a sealing solution then after removing any dry powdery substance the surface is washed with clean water before proceeding as if it were new plaster

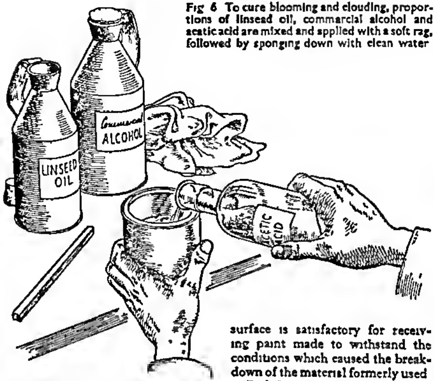


Fig 6 To cure blooming and clouding, proportions of linseed oil, commercial alcohol and acetic acid are mixed and applied with a soft rag, followed by sponging down with clean water

calcium, generally calcium carbonate, otherwise chalk Such paints are quite unsuitable for use where the maximum weather-resisting qualities are demanded from the oil In mixing paint, just sufficient drier should be added to make it solidify in a reasonable time An excess of drier causes a re-arrangement of the atomic structure, which renders the paint less serviceable

Removing Powder

The fine powder, the product of disintegration, is easily removed from the surface by washing with a weak solution of sugar soap. The exposed sound surface should then be cut down in clean water with lump pumice block or waterproof abrasive paper, to provide the necessary key for the new paint, and washed clean When dry, this surface is satisfactory for receiving paint made to withstand the conditions which caused the breakdown of the material formerly used

Pinholing and Pock marking Minute hollows are visible in the surface of the glossy finish of varnish and enamel

They are brought about by adding genuine turpentine or white spirits to varnish and enamel for the purpose of thinning material which had either oxidised or fattened up by contact with air, in order that it might more easily be extended as a film Thinners added to any varnish or enamel may cause this defect in a minor degree, no thorough mixture takes place, the thinner being distributed throughout the body of the material as small globules When the varnish has been extended as a film and has set, the thinner evaporates out, leaving a cavity

Application in a hot, humid atmosphere has also been blamed

for this defect, but it is doubtful if the point has been proved, blooming being the more usual result in these circumstances

Genuine turpentine or white spirit should never be added to a prefabricated material, either varnish or enamel Any fattened material may be used as a binder or medium for paint, as this minor defect, even if it occurred, would not be noticed in the texture of the brushwork

To cure this complaint the surface is cut down with an abrasive to the depth of the hollows and recoated with the appropriate material

Loss of Gloss All glossy surfaces are subject to diminution in brightness or reflective quality with ageing Under normal conditions this is not excessive, but luckily for painters the ultimate dissolution by natural agency of all the materials used in his craft is inevitable

First Evidence

Loss of gloss is the first evidence of attack from the outside It may be caused in the first place by the abrasive action of wind driven grit, which causes pitting and scratching or by airborne deposits and mechanical damage by subsequent dusting and handling Microscopic though these pits may be, they afford lodgment for moisture to which particles of matter adhere, forming accumulations of air-carried materials

These materials may not only cause further mechanical damage when force is applied, but may be of such a character as to destroy by reaction the chemical combinations which form the paint structure In this class are the products of combustion from open fires gas stoves, and mechanical transport, alkaline and sometimes caustic salts and ammonia from the decomposition of vegetable and animal refuse In varying degrees, these exert either a solvent or a destructive action upon the oxidised vegetable oil of the film, which becomes sticky and builds up further accumulations, more securely attached and with the groundwork prepared for their operations

The spores of moulds and fungoid growths which are exceedingly minute are also airborne They find the temperature moisture, and food required for their development and nourishment

The causes from which a film normally loses its useful characteristics are abrasive damage and chemical dissolution The length of service it will render depends mainly upon its protection from or exposure to mechanical damage and its distance from the source of the materials which accomplish its dissolution This period can be considerably extended by washing with clean cold water at frequent intervals a soft carriage sponge and a chamois leather being the only tools required

Fungoid Growths

Mould or fungoid destruction is more insidious in its operation, but more widespread than is generally supposed In fungoids the thread-like growth beneath the surface is colourless, only the cases of seed vessels are pigmented or coloured This means that they have fed for a considerable time upon the structure of the film and possibly destroyed its usefulness before they are discovered

Most painters are only familiar

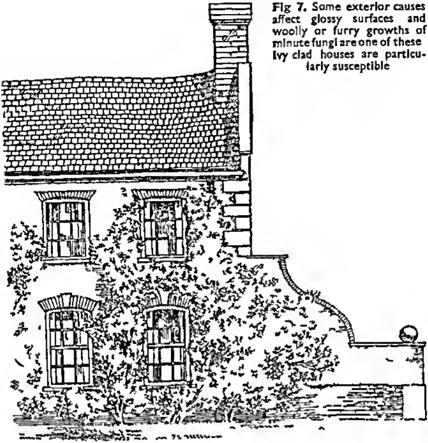


Fig 7. Some exterior causes affect glossy surfaces and woolly or furry growths of minute fungi are one of these Ivy clad houses are particularly susceptible

with the black, white, yellow, and green moulds which grow in such damp, warm places as cellars and greenhouses The structure of these moulds is mostly superficial and they feed mainly upon paints which contain casein or animal glue Mosses also develop upon surfaces which are habitually damp, they, too, destroy gloss and may leave permanent stains

Causing Growths

Fungoid growths may be introduced by the use of unseasoned timber, by using water infected with the spores in the mixing of plaster, by making paint from infected oil, or by airborne ripe spores or seeds Most types of fungoid are colourless with most pigments They feed upon the oil content of the paint, impairing its quality but remaining unseen

When paint contains white lead one variety of fungoid discloses its presence by the formation of pink or violet patches In straight paint heavily pigmented there may not be much discoloration but if white enamel even though pigmented with zinc, is placed upon an infected white lead ground the discoloration may be very pronounced and extensive

Paint-work inside houses which

are covered with ivy is particularly susceptible to deterioration by the action of moulds and fungoids (Fig 7) These are exceedingly small and can only be diagnosed with certainty by microscopic examination and cultivation They are distinct from dry rot, which under favourable conditions attacks and rapidly destroys the structure of timber For this reason, suspected or noted cases of the deterioration of a paint film from unknown causes should at once be referred to a competent authority to diagnose the cause

The usual precaution before repainting old country houses is to strip all paint and paper from timber and plaster surfaces and wash them clean The whole is then given two coats of naphthalene in solution, or of one of the preparations for this purpose obtainable under proprietary names from most paint merchants (Fig 8)

Destroying Bacteria

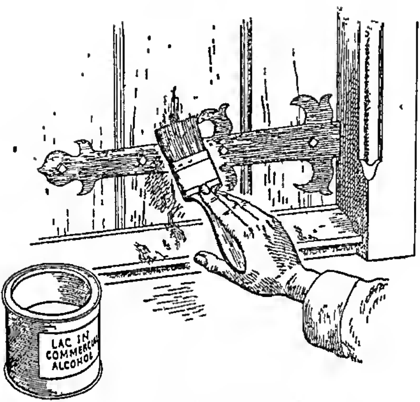
This treatment destroys not only the spores of moulds and fungoids but also the minute bacteria of disease and fermentation However, it does not prevent surface infection of superimposed distemper and water or oil paints These can be rendered less liable to attack only by adding to the final coating a small quantity of crude naphtha or naphthalene in solution

Surface Stains This is a type of surface stain caused by the solvent action of materials which attack the material from below

A patchy appearance results from discoloration and the abnormal adherence of dust

This may be traced to the presence of creosote or other tarlike products within or upon the groundwork, to untreated knots sappy parts,

Fig 8. Surfaces attacked should be stripped down, scrubbed and treated with naphthalene, which may be purchased like varnish in gallon or larger cans.



STAINS CAUSED BY SOLVENT ACTION

Fig 9 Remove the foreign substance by scraping wash the surface with commercial alcohol and then apply two coats of lac dissolved in the same medium

or resinous types of timber, or to contact with the products of combustion through vibration or shrinkage cracks in plaster surfaces

Other Causes

The fabric of indifferently built houses external and partition walls and the spaces between ceilings and floors frequently contain smoke through the faulty pointing of the flues Another cause of these stains is stopping with cheap putty in which the acid in the oil reacts with the solid content

All the foreign matter mentioned above acts upon the oil in the superimposed paint and causes the surface to become soft and sticky Airborne soot and dust adhere to these portions and intensify the disfigurement The occurrence generally indicates indifferent or inadequate preparation of the under surface, and its prevention calls for a more-rigid observance of the instructions laid down for the prepacation of surfaces

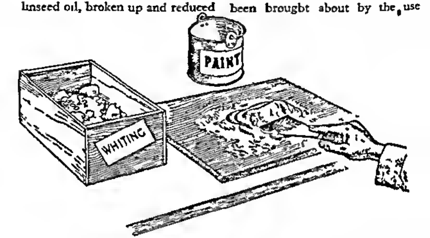
Surface Erosion

To prevent this condition all tar like and resinous substances must be removed as far as possible by scraping the surface and then washing it with commercial alcohol The possibility of contact is then

entirely removed by applying two coats of lac dissolved in the same medium (Fig 9) All cracks in plastered surfaces should be raked out, have their edges slightly undercut, be well dusted out with a dry brush and be painted with *sharp colour The latter should* be made from white lead ground in linseed oil, broken up and reduced as the paint which is to be superimposed, plus an equal quantity of whiting (Fig 10) Ordinary glaziers' putty must not be used for this purpose, as it would prove entirely unsatisfactory

Bleeding

This is a fault that has often been brought about by the use



FILLING NAIL HOLES IN TIMBER SURFACES

Fig 10. Stopping must be specially prepared by mixing to a stiff paste a quantity of whiting with an equal amount of paint similar in quality to that applied to job

to a working consistency with japanner's gold size and genuine turpentine or white spirit in equal quantities

When the paint is dry the crevices are filled with stopping made from Keene's, Parian, or similar *hard cement and water* As soon as the surface of the filling will stand the passage of the brush over its surface, it should be coated with paint of the same composition as that used in the cracks

Filling Cracks

For filling nail holes and *other* defects in timber surfaces, the stopping or putty should be a stiff paste made from the same materials of coal tar dyes in the fabrication of artificially stained pigments

When changing the treatment of a plastered surface from paper-hanging to paint, one still occasionally finds a pattern upon the surface the replica of one printed in a *bleeding colour upon a paper-hanging* of a past period, although there was no evidence of colour upon the plaster surface

Timber surfaces upon which colours of this type have been applied will always discolour future coatings of oil paint unless an *unbroken film of lac is established* between the two Knotting, unless guaranteed free from rosin, is unsuitable for this purpose The

material used must be pure lac dissolved in commercial alcohol only

Darkening Painted surfaces may darken through contact with sulphur or other acid fumes

A metallic lustre is seen, most pronounced upon exposed and open surfaces The paint in the angles and hollows, which draughts and winds pass by, retains its original colour

This defect is most prevalent in paints containing white lead carbonate as the body or main pigment used in the vicinity of chemical, smelting, and gas works and upon sewage disposal farms It is seen in a smaller degree in all large manufacturing towns

Replacing Oil Content

In the latter case the action can be minimised by replacing the oil content of the final coat with an elastic varnish In the former localities and in chemical laboratories, if lead paint is used the discoloration must be acknowledged as a natural sequence which is incidental to its use but does not impair its protective qualities Otherwise it can be replaced by paint made from another pigment

Genuine English vermilion is a pigment which darkens when subjected to bright sunlight, early morning sun being the most active Its use should therefore be avoided where it is likely to be so exposed to direct rays

Interaction between Pigments This is sometimes caused by the acid in the oil medium The most common example is the combination of white lead and genuine synthetic ultramarine blue, both ground in linseed oil The use of these two together as a paint results in a dull, leaden-hued blue which lacks the brilliance obtained when the white lead is replaced by another white pigment, or the blue by another blue

All pigments in general use may be intermixed freely; this, no doubt, is the reason for their persistent employment

Caused by Sunlight

Fading This is a species of fading which is not attributable to loss of gloss

A general lightening of hue and tone value is noticed in the applied paint

The cause is one of alteration in the atomic structure of the paint in the presence of sunlight

This is most common in vandyke brown or other natural pigments which contain bitumen Formerly it was common to most struck colours, that is to pigments obtained by fixing a coal tar dye upon a white base Freedom from this defect is the result of improvements in the dye stuffs and methods of production

Cissing The applied material gathers together in bead like forms and will not remain extended as a film This defect may occur in all types of painting, varnishing, and enamelling, but is not especially prevalent in any

Cissing Troubles

Two dissimilar substances may have been used which cannot combine or form a satisfactory contact, the cohesive force of the applied material being greater than its adhesive or gripping force The same result may be seen through the ground upon which the paint is applied being dirty and greasy

If too long an interval of time is

allowed to elapse between the application of two adjacent films, the surface becomes too hard for a slight penetration of the older film by the medium of the new A similar effect occurs when an attempt is made to extend a film having a water medium upon an oily or greasy surface

Preventive Action

To prevent cissing, all surfaces should be thoroughly cleaned from deposits of grease and dirt Oily or bright surfaces must be cut down with an abrasive to give the finely textured dull ground required for the reception of the new coating

If the cissing has taken place after the material has set it can generally be removed by the solvent action of its own medium, when a fresh start can be made If it has hardened it will have to be cut down to a level surface by the abrasive action of fine grained pumice stone or waterproof glass-paper, lubricated and washed off with water

Flashing arises when the surface displays uneven degrees of gloss in a patchy manner

This effect may result from faulty application of the material from its application upon the wrong type of ground, or from unfavourable atmospheric conditions during drying The fault is most prevalent where a dull or semi flat finish is required

Avoiding Flashing

Care must be taken to make the film regular and of uniform thickness, working out from the wet portion without leaving spaces uncovered The vertical stripes of uneven gloss which disfigure the surface of rouch paint work are the outcome of painting in strips with a gap between each, and covering the gap with paint taken from the strips by the passage of the brush at right angles The strips receive more than enough material and the gaps less than is required This may not show at the time of application, but with the passage of time the *barely covered* portions dull rapidly Carelessness in working one patch into its neighbour will cause a difference in gloss along the joining

To prevent flashing in flatting this material must be applied upon a paint with a glossy finish as soon as it is surface dry and *before it* has time to become hard dry For an oil paint which dries with a full gloss finish the undercoating must dry with a dull or flat surface Similarly in varnishing a flatting varnish with dull finish is applied upon a dry gloss varnish before *it has had time to harden*, *but if a* gloss finish is to be obtained the gloss varnish of the first coating must be cut down to an even dull ness before the full gloss finishing varnish is put on

Sheary Surfaces

If these practices are not observed the surface will be sheary, a trade term for flashing in a varnish finish Close humid climatic conditions absence of adequate ventilation and the opposite extremes, strong draughts and low temperatures during the process of drying, are all liable to cause patchiness in the gloss or dullness of the finish

Bad flashing in a dull finish can *only be cured by cutting down* regrounding and reflatting Indifferent gloss upon oil paint or varnish which should dry with a

full gloss entails cutting down the faulty surface with an abrasive to an even dullness and recoating

Lack of Opacity This condition is also described by the expressive term, "grinning through"

In appearance, the undercoating shows through the newly applied film, thus influencing both its colour and tone value

Over thinning Paint

Its cause may be due to over-thinning with either medium or thinner, or both, a transparent or semi-transparent pigment may have been incorporated in the mixture when one of greater density was required, or too great a difference in colour and tone been made between the undercoating and the superimposed film

To prevent this condition a satisfactory balance should be maintained between pigment, medium, and thinner, having in mind the service to be rendered The colour and tone value of a finish must be built up in progressive stages instead of trusting to the last coating The pigmental or solid part of the paint must be carefully selected and sufficiently opaque pigments used for obscuring Transparent pigments should be used only for glazes, their use as stains to impart colour to opaque paints is apt to lead to over thinning

Semi transparent paints must be given additional coatings to obtain adequate opacity

Gelatination This condition is known as livering in paint and curdling or feeding up in varnish

In appearance the liquid paint assumes a jelly-like form The addition of more thinner frequently accentuates the colloidal or gel condition of the material

A pigment type of drier or thinner has been included which reacts with the oil medium, causing premature gelation during transformation from the liquid to the solid state This may take place *in the container or during manipulation* of the paint under the brush by the formation of bead-like aggregations

Note should be taken of combinations which cause this physical alteration and the same or similar mixtures avoided in future The excessive use of liquid driers is also to be avoided Prefabricated or ready-mixed paints made by different manufacturers should never be mixed together, nor should liquid driers be added to paint obtained ready for use

There is no cure The material is useless as paint and should be thrown away

Crystallising This phenomenon is rarely met with, but the craftsman should be prepared to recognise and deal with it if necessary

Unusual Symptoms

The surface is similar in appearance to that upon new galvanised iron or to that which can be obtained with a dried solution of Epsom salts upon glass, but of smaller texture

It is generally attributed to the excessive use of the acetate drier sugar of lead in paint, by contact with a draught of cold air or by a marked fall in temperature at a critical stage in the drying of paint, varnish, or enamel, which causes a rapid change in its atomic structure instead of the normal gelatination

The use of concentrated acetate drier should be avoided when mixing paint The surfaces of drying

paint, enamel, and varnish should be protected during frosty weather These materials should never be applied upon a very cold surface

To cure crystallising, the defective film must be removed with a paint or varnish stripper When the work is re-executed care should be taken to avoid excess of drier in the new paint This, together with varnish or enamel, must be applied only when the temperature of the undercoatings and of the atmosphere is satisfactory The drying material should be shielded from draughts

Faulty Manipulation Such terms as ropiness, ridging, crinkling, sagging, curtaining, festooning, and running express in a descriptive manner the appearance of defects which are the result of faulty manipulation of the wet film during its extension This may be due to lack of experience on the part of the operative, if so, it will be remedied as his skill improves

Using Wrong Brush

He may be using a poor quality brush, or the wrong type of brush, which gives unsatisfactory extension and makes laying-off difficult The physical condition of the material at the time of its application may also prevent its satisfactory extension by being too thick and viscous Insufficient medium or thinner may have been incorporated, or partial oxidation may have occurred through long contact with the air

Such paint, besides being difficult to extend, leads to films being built up which are too thick to remain static during setting that is, the preliminary stage of drying As a rule, carelessness and lack of interest in the work are responsible for both poor manipulation and supply exceeding requirements If these faults are corrected in the operative and he is supplied with well-balanced, freshly-made material and the correct type of brush, the defects enumerated above will not occur.

Defects in Papered Surfaces Defects in paper-hanging are the result of inadequate preparation of the ground, faulty preparation of the adhesive, or insufficient knowledge of the material being applied

The general preventative measure is that all surfaces to receive paper must be clean level, slightly absorbent, and stable

Indifferent adhesion is demonstrated by the paper leaving the surface upon which it is placed This occurs most frequently at the extremities of the lengths and along their edges

Included in the causes which lead to this is that the groundwork may have been left too absorbent, in which case the major part of the paste is taken into the fabric of the plaster, leaving insufficient to build up an adequate bond between the paper and the wall

At the juncture of wall and cornice or ceiling glue-bound distemper or water paint may have been carried down upon the wall face When either size or paste in colloidal form is dried by a fairly rapid loss of its water content by evaporation, it is converted into a stiff jelly which grips both the surfaces in contact with it For all intents and purposes it has now become a solid, but contraction of its bulk continues, while the materials gripped on either side remain stable or fixed The consequences are that one of the artificial bonds created is unable to

resist the strain and cleavage occurs generally at the surface of the plaster

At the bottoms and round the casings of doors and windows the paint of the woodwork is generally carried for a short distance on to the surface of the plaster (Fig 11) The colloids of both preparation and paste here form a film between two materials which differ greatly in their composition and porous character The bond or grip of each also differs Therefore, when the ageing strain is exerted the weakest bond fails As a rule, this is the one between paint and preparation Hence the paper is left free and unattached Carelessness in pasting may have left the edges insufficiently supplied with fixative to overcome the suction of the surface and still to leave enough for adhesion

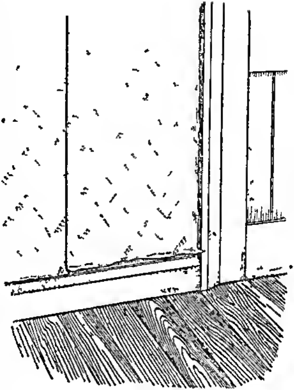


Fig 11 Indifferent adhesion of paper is often due to the painter infringing on to the wall plaster

The paste itself may have been too thin Over dilution with water not only lessens the quantity of gummy matter distributed over the surface but also hastens the loss of water owing to the ease with which it is absorbed by both paper and plaster Therefore the small quantity of adhesive present is dried off before it can create a substantial bond

In paste the viscosity or power of resisting a change in its atomic arrangement must always be sufficient to overcome or balance the suck or intake of an absorbent surface For instance, the fabric upon which the paste is applied must remain firm and not become wet, limp, and flabby When it is placed upon the space it is to occupy sufficient adhesive in a jelly form must remain available for sliding into position and fixing These requirements demand very careful attention, first in making and thinning the paste, and, secondly, in the interval of time allowed to elapse between the pasting of the paper and its extension upon the surface.

The paste may lose its grip by fermentation or by development

of moulds and certain fungoid growths upon, within, or below the paper through contact with moisture. This may be brought about by the fabric of the building becoming damp or by excessively humid conditions Pastes are less liable to attack if a small quantity of borax is added at the time of making Situations which are habitually damp are unsuitable for hanging with paper

Faulty Pasting

Loss of relief in textured papers is generally the result of faulty pasting The back surfaces of all such materials have been factory-treated to reduce their absorptive qualities and retain the relief It is therefore a mistake to soak or overload them with paste, such treatment causes loss of relief It also provides in excess a material which in bulk, by the natural process of ageing, breaks up into flakes or becomes friable In either form it is useless for its original purpose The paste should be extended only as a film and must not be allowed to fill the hollows

The paper, when placed in position upon the space it is to occupy, should be beaten down into contact with the ends of the bristles, not brushed out It is inadvisable to use a roller, however soft or sponge-like in texture

Wood pulp, the vegetable fibre from which most papers are made, naturally darkens with age The process is most rapid when the paper is exposed to bright sunlight. This must always be borne in mind, as must the disfigurement caused where pictures hang upon the wall and prevent such darkening Since grass cloths, parchment, and leather-covered papers have no pattern along their edge which can be matched and frequently vary in tone, their meeting edges always show These butting edges can be hidden by covering the join either with a small border or with a stencil pattern in paint

Preventable defects include the uneven character of the plaster surface and nibs upon it The former is caused generally by carelessness When repairs have been carried out, the plane of the wall or ceiling has been broken. Nibs are due to inadequate glasspapering or failure to strain the size or the paste before use

Unsatisfactory joints may occur between adjacent lengths There may be glossy and dirty marks along the joints, these are caused by carelessness in pasting and dirty tools and hands in application

The lapping of joints rendered necessary by the removal of only one selvedge edge always forms an objectionable line through the two thicknesses of paper at that point Butt joining should be the normal procedure

Carelessness in trimming may leave an opening along some portion of the joint. If a patterned paper is used it may have been so cut that correct matching of the design is impossible Bad matching may also be caused by careless pasting or difference in the quantity of paste applied on adjacent areas Its liquid content and the lengths of time it is allowed to soak all influence the stretch which takes place when the paper is being brushed out upon the surface

Care in preparation of surface and material, cleanliness in working, and an intelligent interest in the work will go far to prevent the defects and faults just enumerated

TABLES AND USEFUL DATA

The reader will find a number of tables throughout the book which will be of assistance to him in his work and studies. They are mostly included with their relevant text, but in the following pages there are some others of general interest. A complete reference list appears below.

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LEAD PAINT REGULATIONS

Below, in full, are the instructions issued by the Home Office for the protection of persons using lead paint for the painting and decorating of buildings, and reproduced by permission of the Controller of H M Stationery Office Crown copyright.

In pursuance of Section 1 of the Lead Paint (Protection against Poisoning) Act 1926 I hereby make the following Regulations for preventing danger from lead paint * to persons employed in or in connection with the painting of buildings †

Provided that Regulations 4 5 7, 9, 11, *and* 12 *shall not apply to persons who* are occasionally employed in or in connection with the painting of buildings for an aggregate period not exceeding 26 normal working days in a calendar year and whose ordinary employment does not include the painting of buildings

These Regulations may be cited as the Lead Paint Regulations 1927 and shall come into force on the 1st October, 1927

Duties

It shall be the duty of all persons who employ persons in or in connection with the painting of buildings to observe Part I of these Regulations

It shall be the duty of all persons employed in or in connection with the painting of buildings to observe Part II of these Regulations

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PART I

Duties of Employers

1.—*(a)* Lead paint shall not be used or procured for use for the painting of buildings except in the form of paste or of paint ready for use Provided that red lead may be procured for use and used in the raw or dry state to such extent as may be necessary for preparing stopping or filling material and for no other purpose

(b) Lead paint for use in the painting of buildings shall not be procured or stored whether at the employer's premises or at any place where painting is being done otherwise than in receptacles legibly marked as containing lead

2 Lead paint shall not be applied in the form of spray in the interior painting of buildings

3.—*(a)* No painted surface other than that of iron or steel work shall be rubbed down or scraped by a dry process

(b) No painted surface of iron or steel work shall be rubbed down or scraped by a dry sand papering process

(c) All debris produced by rubbing down or scraping of any painted surface shall be removed before it becomes dry

(d) No contravention of the foregoing provisions shall be deemed to have taken place in respect of any painted surface if the employer proves that such painted surface contained no lead paint

4 There shall be provided for the use of persons employed in or in connection with the painting of buildings and liable to come into contact with lead

---

* "Lead paint" means any *paint paste spray stopping* filling or other material used in painting which, when treated in a manner prescribed by rules made by the Secretary of State yields to an aqueous solution of hydrochloric acid a quantity of soluble lead compound exceeding when calculated as lead monoxide five per cent. of the dry weight of the portion taken for analysis—*see* Section 7 of the Act

† By section 7 of the Act the expression "building" includes "fixtures."

paint a sufficient supply of water, soap, nail brushes and towels and at least one bucket or basin for every five persons so employed.

5. Suitable arrangements shall be made to prevent clothing taken off during working hours by persons employed in or in connection with the painting of buildings, being soiled by lead paint Where practicable the accommodation so provided shall be outside any apartment in which painting is being carried on.

6. Where the Chief Inspector of Factories is satisfied that the incidence of lead poisoning among the persons employed by any employer in or in connection with the painting of buildings with lead paint is excessive, he shall give notice thereof in writing to such employer, and such employer shall forthwith make arrangements for the periodic medical examination of all persons so employed by him and for the suspension from employment in or in connection with painting with lead paint of such persons whose health is or appears likely to be injuriously affected thereby, in accordance with such conditions as the Chief Inspector of Factories may prescribe.

7.—(a) The employer shall give to each person employed by him in or in connection with the painting of buildings when he is engaged, and subsequently if still employed as aforesaid, on the first pay day in each calendar year, a copy of the prescribed leaflet containing special health instructions as to the use of paint

(b) A printed copy of these Regulations shall be posted in the workshop and paint store, and, on all jobs on which more than 12 persons are employed in painting operations, in any apartment in which the paints are mixed

8. Where any person whose ordinary employment does not include the painting of buildings is occasionally employed in or in connection with the painting of buildings, the employer shall keep a record of the periods with dates during which such person is so employed by him, and such record shall be open at all reasonable times to the inspection of H M Inspector of Factories

For the purposes of these Regulations, the employment of such person as aforesaid for a period of less than half of a normal working day shall be deemed to be half-a-day and of less than a whole normal working day but more than half-a-day shall be deemed to be a whole day

PART II

Duties of Persons Employed

9. Overalls shall be worn during the whole of the working period by every person employed in or in connection with the painting of buildings and liable to come into contact with lead paint, and shall be washed at least once a week They shall not be worn at meal times

10. Every person employed in rubbing down or scraping any painted surface shall carry on his work in accordance with the requirements of Regulation 3 hereof

11. Every person employed in or in connection with the painting of buildings shall so deposit his clothing taken off during working hours as to prevent it being soiled by lead paint, and for this purpose shall as far as practicable make use of the accommodation provided in pursuance of Regulation 5 hereof

12 Every person employed in or in connection with the painting of buildings and liable to come into contact with lead paint shall carefully clean and wash his hands before partaking of food or leaving the premises

13. Every person employed in or in connection with the painting of buildings and liable to come into contact with lead paint shall present himself at the appointed time for medical examination when so required in accordance with Regulation 6.

MATERIALS FOR PAINTING

Here is a list of specifications, which have been issued by the British Standards Institution, dealing with the composition of materials

PAINTING

B.S.
1160 : 1944 **Protective Painting of Iron and Steel other than in buildings.**

CO (C) 570 **Camouflage Paint Surfaces Chart**

COLOURS

381 1930 **Schedule of Colours for Ready Mixed Paints** (including Colorimetric Analysis) *Amendment* Feb. 1931 Nov 1933 Aug 1934 and June 1941

381C 1943 **Colours for Ready Mixed Paints (Folded Card).**

543 : 1934 **British Standard Colour Schedule** (of general application).

987C 1942 **Camouflage Colour Card**

PIGMENTS

927 1940 **Pigments : White Black and Coloured** *including*

- 927 **Alternatives for Lead and Zinc Chromes.**
- 928 **Alternatives for Brunswick or Chrome Greens and Green Oxides of Chromium.**

1014 : 1942 **Pigments for Colouring Cement** Magnesium Oxychloride and Concrete.

WHITE

239 : 1935 **White Pigments** *including*

- 239 Genuine White Lead
- 254 Zinc Oxide (Types 1 and 2) *Amendment* Dec 1940.
- 296 Lithopone
- 338 Antimony Oxide
- 391 Titanium Dioxide
- 636 Titanium White *Amendment* Jan. 1943
- 637 Basic Sulphate of Lead.

BLACK (Carbon)

284 : 1937 **Black (Carbon) Pigments** *including*

- 284 Carbon Black. *Amendment* Dec. 1940.
- 285 Bone Black. *Amendment* Dec. 1940.
- 286 Vegetable Black *Amendment* Dec., 1940.
- 287 Lamp Black. *Amendment* Dec. 1940.
- 288 Mineral Black. *Amendment* Dec. 1940.

RED

217 : 1936 **Red Lead**

IRON OXIDES

RED

B.S.
272 : 1936 **Red Oxides of Iron** (Natural, Manufactured and Blended) *including*

- 272 Natural Red Oxides of Iron (Grades A and B) *Amendment* Dec., 1940.
- 305 Manufactured Red Oxides of Iron (excluding Venetian Red). *Amendment* Dec., 1940.
  - Type 1 Indian and Turkey Reds.
  - Type 2 Other Manufactured Oxides
- 604 Blended Red Oxides of Iron. *Amendment* Dec., 1940

370 1938 **Venetian Red**

BLACK AND PURPLE

306 : 1937 **Black and Purple Oxides of Iron** *including*

- 306 Black Oxide of Iron.
- 339 Purple Oxides of Iron. *Amendment* Dec. 1940.

EARTH COLOURS

312 1937 **Earth Colours** *including*

- 312 Natural Siennas (Raw and Burnt).
- 313 Natural Umber (Raw and Burnt).
- 310 Vandyke Brown.
- 337 Ochre *Amendment* Dec., 1940.

CHROMES GREENS AND INORGANIC BLUES

282 : 1938 **Lead Chromes and Zinc Chromes** *including*

- 282 Lead Chromes. *Amendment* Dec. 1940.
- 389 Zinc Chromes. *Amendment* Dec. 1940.

283 1938 **Prussian Blue**

303 1938 **Green Pigments** *including*

- 303 Brunswick or Chrome Greens (Pure and Reduced). *Amendment* Dec. 1940 and Aug 1942.
- 318 Green Oxide of Chromium. *Amendment* Dec. 1940.

314 1938 **Ultramarine Blue**

HYDRATED OXIDES

851 : 1939 **Marigold Maroon and Yellow**

VERMILION

B S

320 : 1938 **Vermilion and Red Pigment,** *including*

320 Vermilion.

333 Red Pigment (Red Lakes, Toner or Pigment Dyestuffs) *Amendment,* Aug., 1942

METALLIC

388 : 1938 **Aluminium (Powder and Paste).** *Amendment,* Dec., 1940

OIL PASTES

241 : 1935 **White Oil Paste,** *including*

241 Genuine White Lead.

273 Zinc Oxide.

297 Lithopone

390 : 1938 **Oil Pastes** (excluding White Lead, Zinc Oxide and Lithopone)

DISTEMPERS

1053 1942 **Water Paints and Distempers for Interior Use**

EXTENDERS

255 : 1938 **Extenders,** *including*

255 Asbestine. *Amendment,* Dec., 1940

260 Barytes *Amendment,* Dec., 1940.

281 Blanc Fixe *Amendment,* Dec., 1940

301 Silica. *Amendment,* Dec., 1940

PAINTS, READY MIXED (OIL GLOSS)

261 : 1936 **Ready Mixed Paints (Oil Gloss),** *including*

261 White (White Lead Base) *Amendment,* Dec., 1940.

262 Tinted (White Lead Base) *Amendment,* Dec. 1940

277 White (Zinc Oxide Base) *Amendment,* Dec., 1940

278 Tinted (Zinc Oxide Base) *Amendment,* Dec. 1940.

293 Green. *Amendment,* Dec., 1940

294 Black *Amendment,* Oct., 1939 and Dec., 1940.

295 Red Oxide of Iron. *Amendment,* Dec., 1940

371 Purple Brown Oxide of Iron. *Amendment,* Dec., 1940.

929 : 1943 **Ready Mixed Paints.** Priming Paint, Undercoating Paints. Finishing Coat Paints—Oil Gloss *Amendment,* Dec., 1943

987 1942 **Camouflage Paints.**

1011 : 1942 **Red Lead Ready Mixed Paints.**

1033 : 1942 **Priming Paint (Lead Base) for the Protection of Steel Sheet.** *Amendment,* May, 1944.

B S

1037 : 1942 **Substitute Paints for Exterior Finishing**

1070 1942 **Black Paint (Tar Base) for use on Iron and Steel.**

1124 : 1942 **Household Paint** for exterior use

1128 : 1943 **Recommendations for Primers** for camouflage paints

1176. 1944 **Air Drying Black Paint for Cooking Appliances**

DRIERS

331 1938 **Driers,** *including*

331 Paste Driers

332 Liquid Driers

VARNISHES AND GOLD SIZE

256 1936 **Varnishes,** *including*

256 Interior Oil Varnish.

257 Exterior Oil Varnish.

258 Flatting or Rubbing Oil Varnish.

274 Extra Hard Drying Varnish.

311 : 1936 **Gold Size.**

954 1941 **Lac.**

OILS

242 1936 **Linseed Oil,** *including*

242 Refined Linseed Oil *Amendment,* Dec., 1940.

243 Raw Linseed Oil. *Amendment,* Dec., 1940

259 Boiled Linseed Oil. *Amendment* Dec., 1940.

391 1936 **Tung Oil** *Amendment,* Dec., 1940

925 1940 **Oils, Thinners, Driers and Extenders,** *including*

925 Oil (Linseed Oil Base)

926 Additional Extenders

VOLATILE THINNERS

244 1936 **Turpentine, Type 1, and White Spirit** *Amendment, Dec., 1936, including*

244 Turpentine, Type 1 *Amendment,* Dec., 1940

245 White Spirit *Amendment,* Dec., 1940

290 Turpentine, Type 2. *Amendment,* Dec., 1940.

PUTTY

544 1934 **Linseed Oil Putty** (Types 1 and 2) for Wooden and Metal Frames. *Amendment,* Feb., 1939, and Dec., 1940.

METHODS OF TEST

188 1937 **Determination of Viscosity of Liquids in Absolute (C.G.S.) Units,** Method for the. *Amendment,* Jan., 1940.

TABLE OF DISCOUNTS

Useful table that shows at a glance percentages of profit on cost and also the profits remaining to you after you have allowed discounts

When you get	Your profit will be	When you get	And you allow	Your profit will be
$4\frac{4}{5}$ % off	5 % on cost	60 % off	50 % off	[illegible]5 %
5	$5\frac{1}{2}$	60	45	$37\frac{1}{2}$ "
$6\frac{1}{4}$	$6\frac{2}{3}$	60	40	50 "
7[illegible]	$8\frac{1}{3}$	60	$33\frac{1}{3}$	$66\frac{2}{3}$ "
$8\frac{1}{3}$	$9\frac{1}{11}$ "	60	30	[illegible]5
$9\frac{1}{11}$	10	60	25	$87\frac{1}{2}$
10	$11\frac{1}{9}$	50	40	20
$11\frac{1}{9}$	1[illegible] $\frac{1}{2}$	50	$33\frac{1}{3}$ "	$33\frac{1}{3}$
1[illegible] $\frac{1}{2}$	$14\frac{2}{7}$	50	30	40
13	15	50	25	50
14[illegible]	$16\frac{2}{3}$	50	[illegible]0	60
15	1[illegible]	50	15 "	[illegible]0
$16\frac{2}{3}$	20	40	$33\frac{1}{3}$	$11\frac{1}{9}$
[illegible]0	25	40	30	$16\frac{2}{3}$
23	30	40	25	25
[illegible]5	$33\frac{1}{3}$	40	20	$33\frac{1}{3}$
[illegible]6	35	40	15	$41\frac{2}{3}$
$27\frac{1}{4}$	37	40	10	50
$28\frac{1}{7}$	40	$33\frac{1}{3}$	25	$12\frac{1}{2}$
30	$42\frac{6}{7}$	$33\frac{1}{3}$	20	20
31	45	$33\frac{1}{3}$	15	$27\frac{1}{2}$
[illegible]$3\frac{1}{3}$	50	$33\frac{1}{3}$ "	10	35
$35\frac{1}{2}$	55	$33\frac{1}{3}$	5	$42\frac{1}{2}$
3[illegible]$\frac{1}{2}$	60	30	2[illegible]	$7\frac{1}{7}$
40	$66\frac{2}{3}$	30	20	14[illegible]
4[illegible]$\frac{6}{7}$	75	30	15	$21\frac{3}{7}$
45	$81\frac{9}{11}$	30	10	28[illegible]
50	100	30	5	35[illegible]
55	1[illegible]2[illegible]	25	20	$6\frac{2}{3}$
60	150	25	1[illegible]	$15\frac{1}{3}$
$66\frac{2}{3}$	200 "	25	10	20
75	300 "	25 " "	5	$26\frac{2}{3}$ "
80	400	20	15	$6\frac{1}{4}$
$83\frac{1}{3}$	500 "	20 "	10 "	$12\frac{1}{2}$
90	900	20	5 "	$18\frac{3}{4}$

TEMPERATURE EFFECT OF SUN

Results of tests made by The U S National Bureau of Standards to determine the varying extents to which the sun raises the temperature of painted and other surfaces Average differences in temperature between the surfaces and the surrounding air are given in the first table, while, below this, the relative temperature rises are shown in comparison with the black surface taken as a standard

DAILY MEAN RISE IN TEMPERATURE IN DEGREE F OF TEST PANELS EXPOSED TO THE SUN

DATE	AUG 2	AUG 3	AUG 1	JULY 31	AUG 7
Panel inclination from horizontal	90°	90°	60°	45°	30°
	deg F.	*deg F*	*deg F*	*deg F*	*deg F*
Black (lampblack)	20 9	21·0	37 4	46 3	48 5
Galvanised iron	16 1	15 3	28 1	32 0	37·7
Roofing shingle, aluminium	19 4	20 2	34 1	40 7	41 6
Roofing shingle, green	19 5	20 7	33 3	41 3	43 4
Roofing shingle, red	21 5	23 1	37 2	44 8	46 0
White gloss paint	8 9	7 9	12 1	13 0	15 5
White flat paint	9 1	8 3	13 2	15 6	17 2
Ivory paint	10 2	9 3	14 9	16 8	19 2
Canary-yellow paint	10 9	10 4	16 7	19 2	21 6
Pearl grey paint	13 3	13 7	20 3	24 3	25·6
Silver-grey paint	13 9	14 2	20 3	24 6	26 3
Light lead-coloured paint	15 1	15 2	22 9	27 4	29·7
Slate paint	16 8	17 1	26 7	32 4	35 4
Medium-green paint	20 4	20 5	35 3	42 7	46 3

RELATIVE RISE IN TEMPERATURE OF TEST PANELS EXPOSED TO THE SUN

(Black taken as 100)

DATE:	AUG 2	AUG 3	AUG 1	JULY 31	AUG 7
Panel inclination from horizontal	90°	90°	60°	45°	30°
	deg F	*deg F*	*deg F*	*deg F*	*deg F*
Black (lampblack)	100	100	100	100	100
Galvanised iron	77	73	75	69	78
Roofing shingle, aluminium	93	96	91	88	86
Roofing shingle green	93	99	89	89	90
Roofing shingle red	103	110	100	97	95
White gloss paint	43	38	32	28	31
White flat paint	44	40	35	34	35
Ivory paint	49	44	30	36	40
Canary yellow paint	52	50	45	41	45
Pearl grey paint	64	65	54	53	53
Silver grey paint	67	68	54	53	54
Light lead coloured paint	72	72	61	59	61
Slate paint	80	82	71	70	73
Medium green paint	98	98	94	92	96

TEMPERATURE CONVERSION TABLE

There are three types of thermometer scale in use—Fahrenheit, Centigrade and Reaumur—each possessing a different system of division into units Conversion from one to the other is governed by the following facts

In the Fahrenheit system, the freezing point of water is 32 deg and its boiling point 212 deg

In the Centigrade system, the freezing point of water is 0 deg, and its boiling point 100 deg

In the Reaumur system, the freezing point of water is taken as 0 deg and its boiling point 80 deg

Fahr	*Cent*	*Reaum*	*Fahr*	*Cent*	*Reaum*	*Fahr*	*Cent*	*Reaum*
212	100.0	80.0	181	82.8	66.2	150	65.6	52.4
211	99.4	79.6	180	82.2	65.8	149	65.0	52.0
210	98.9	79.1	179	81.7	65.3	148	64.4	51.6
209	98.3	78.7	178	81.1	64.9	147	63.9	51.1
208	97.8	78.2	177	80.6	64.4	146	63.3	50.7
207	97.2	77.8	176	80.0	64.0	145	62.8	50.2
206	96.7	77.3	175	79.4	63.6	144	62.2	49.8
205	96.1	76.9	174	78.9	63.1	143	61.7	49.3
204	95.6	76.4	173	78.3	62.7	142	61.1	48.9
203	95.0	76.0	172	77.8	62.2	141	60.6	48.4
202	94.4	75.6	171	77.2	61.8	140	60.0	48.0
201	93.9	75.1	170	76.7	61.3	139	59.4	47.6
200	93.3	74.7	169	76.1	60.9	138	58.9	47.1
199	92.8	74.2	168	75.6	60.4	137	58.3	46.7
198	92.2	73.8	167	75.0	60.0	136	57.8	46.2
197	91.7	73.3	166	74.4	59.6	135	57.2	45.8
196	91.1	72.9	165	73.9	59.1	134	56.7	45.3
195	90.6	72.4	164	73.3	58.7	133	56.1	44.9
194	90.0	72.0	163	72.8	58.2	132	55.6	44.4
193	89.4	71.6	162	72.2	57.8	131	55.0	44.0
192	88.9	71.1	161	71.7	57.3	130	54.4	43.6
191	88.3	70.7	160	71.1	56.9	129	53.9	43.1
190	87.8	70.2	159	70.6	56.4	128	53.3	42.7
189	87.2	69.8	158	70.0	56.0	127	52.8	42.2
188	86.7	69.3	157	69.4	55.6	126	52.2	41.8
187	86.1	68.9	156	68.9	55.1	125	51.7	41.3
186	85.6	68.4	155	68.3	54.7	124	51.1	40.9
185	85.0	68.0	154	67.8	54.2	123	50.6	40.4
184	84.4	67.6	153	67.2	53.8	122	50.0	40.0
183	83.9	67.1	152	66.7	53.3	121	49.4	39.6
182	83.3	66.7	151	66.1	52.9	120	48.9	39.1

WAGES

Hours	-/½ per hour	-/1 per hour	-/6 per hour	1/- per hour	1/6 per hour	1/7 per hour	1/8 per hour	1/9 per hour	1/10 per hour	1/11 per hour	2/- per hour	2/2 per hour	2/3 per hour
¼		-/¼	-/1½	-/3	-/4½	-/4¾	-/5	-/5¼	-/5½	-/6	-/6	-/6½	-/6¾
½	-/¼	-/½	-/3	-/6	-/9	-/9½	-/10	-/10½	-/11	-/11½	1/-	1/1	1/1½
¾		-/¾	-/4½	-/9	1/1½	1/2¼	1/3	1/3¾	1/4½	1/5¼	1/6	1/7½	1/8¼
1	-/½	-/1	-/6	1/-	1/6	1/7	1/8	1/9	1/10	1/11	2/-	2/2	2/3
2	-/1	-/2	1/-	2/-	3/-	3/2	3/4	3/6	3/8	3/10	4/-	4/4	4/6
3	-/1½	-/3	1/6	3/-	4/6	4/9	5/-	5/3	5/6	5/9	6/-	6/6	6/9
4	-/2	-/4	2/-	4/-	6/-	6/4	6/8	7/-	7/4	7/8	8/-	8/8	9/-
5	-/2½	-/5	2/6	5/-	7/6	7/11	8/4	8/9	9/2	9/7	10/-	10/10	11/3
6	-/3	-/6	3/-	6/-	9/-	9/6	10/-	10/6	11/-	11/6	12/-	13/-	13/6
7	-/3½	-/7	3/6	7/-	10/6	11/1	11/8	12/3	12/10	13/5	14/-	15/2	15/9
8	-/4	-/8	4/-	8/-	12/-	12/8	13/4	14/-	14/8	15/4	16/-	17/4	18/-
9	-/4½	-/9	4/6	9/-	13/6	14/3	15/-	15/9	16/6	17/3	18/-	19/6	20/3
10	-/5	-/10	5/-	10/-	15/-	15/10	16/8	17/6	18/4	19/2	20/-	21/8	22/6
11	-/5½	-/11	5/6	11/-	16/6	17/5	18/4	19/3	20/2	21/1	22/-	23/10	24/9
12	-/6	1/-	6/-	12/-	18/-	19/-	20/-	21/-	22/-	23/-	24/-	26/-	27/-
13	-/6½	1/1	6/6	13/-	19/6	20/7	21/8	22/9	23/10	24/11	26/-	28/2	29/3
14	-/7	1/2	7/-	14/-	21/-	22/2	23/4	24/6	25/8	26/10	28/-	30/4	31/6
15	-/7½	1/3	7/6	15/-	22/6	23/9	25/-	26/3	27/6	28/9	30/-	32/6	33/9
16	-/8	1/4	8/-	16/-	24/-	25/4	26/8	28/-	29/4	30/8	32/-	34/8	36/-
17	-/8½	1/5	8/6	17/-	25/6	26/11	28/4	29/9	31/2	32/7	34/-	36/10	38/3
18	-/9	1/6	9/-	18/-	27/-	28/6	30/-	31/6	33/-	34/6	36/-	39/-	40/6
19	-/9½	1/7	9/6	19/-	28/6	30/1	31/8	33/3	34/10	36/5	38/-	41/2	42/9
20	-/10	1/8	10/-	20/-	30/-	31/8	33/4	35/-	36/8	38/4	40/-	43/4	45/-
21	-/10½	1/9	10/6	21/-	31/6	33/3	35/-	36/9	38/6	40/3	42/-	45/6	47/3
22	-/11	1/10	11/-	22/-	33/-	34/10	36/8	38/6	40/4	42/2	44/-	47/8	49/6
23	-/11½	1/11	11/6	23/-	34/6	36/5	38/4	40/3	42/2	44/1	46/-	49/10	51/9
24	1/-	2/-	12/-	24/-	36/-	38/-	40/-	42/-	44/-	46/-	48/-	52/-	54/-
25	1/0½	2/1	12/6	25/-	37/-	39/7	41/8	43/9	45/10	47/11	50/-	54/2	56/3
26	1/1	2/2	13/-	26/-	39/-	41/2	43/4	45/6	47/8	49/10	52/-	56/4	58/6
27	1/1½	2/3	13/6	27/-	40/6	42/9	45/-	47/3	49/6	51/9	54/-	58/6	60/9
28	1/2	2/4	14/-	28/-	42/-	44/4	46/8	49/-	51/4	53/8	56/-	60/8	63/-
29	1/2½	2/5	14/6	29/-	43/6	45/11	48/4	50/9	53/2	55/7	58/-	62/10	65/3
30	1/3	2/6	15/-	30/-	45/-	47/6	50/-	52/6	55/-	57/6	60/-	65/-	67/6
31	1/3½	2/7	15/6	31/-	46/6	49/1	51/8	54/3	56/10	59/5	62/-	67/2	69/9
32	1/4	2/8	16/-	32/-	48/-	50/8	53/4	56/-	58/8	61/4	64/-	69/4	72/-
33	1/4½	2/9	16/6	33/-	49/6	52/3	55/-	57/9	60/6	63/3	66/-	71/6	74/3
34	1/5	2/10	17/-	34/-	51/-	53/10	56/8	59/6	62/4	65/2	68/-	73/8	76/6
35	1/5½	2/11	17/6	35/-	52/6	55/5	58/4	61/3	64/2	67/1	70/-	75/10	78/9
36	1/6	3/-	18/-	36/-	54/-	57/-	60/-	63/-	66/-	69/-	72/-	78/-	81/-
37	1/6½	3/1	18/6	37/-	55/6	58/7	61/8	64/9	67/10	70/11	74/-	80/2	83/3
38	1/7	3/2	19/-	38/-	57/-	60/2	63/4	66/6	69/8	72/10	76/-	82/4	85/6
39	1/7½	3/3	19/6	39/-	58/6	61/9	65/-	68/3	71/6	74/9	78/-	84/6	87/9
40	1/8	3/4	20/-	40/-	60/-	63/4	66/8	70/-	73/4	76/8	80/-	86/8	90/-
41	1/8½	3/5	20/6	41/-	61/6	64/11	68/4	71/9	75/2	78/7	82/-	88/10	92/3
42	1/9	3/6	21/-	42/-	63/-	66/6	70/-	73/6	77/-	80/6	84/-	91/-	94/6
43	1/9½	3/7	21/6	43/-	64/6	68/1	71/8	75/3	78/10	82/5	86/-	93/2	96/-
44	1/10	3/8	22/-	44/-	66/-	69/8	73/4	77/-	80/8	84/4	88/-	95/4	99/-
45	1/10½	3/9	22/6	45/-	67/6	71/3	75/-	78/9	82/6	86/3	90/-	97/6	101/3
46	1/11	3/10	23/-	46/-	69/-	72/10	76/8	80/6	84/4	88/2	92/-	99/8	103/6
47	1/11½	3/11	23/6	47/-	70/6	74/5	78/4	82/3	86/2	90/1	94/-	101/10	105/9
48	2/-	4/-	24/-	48/-	72/-	76/-	80/-	84/-	88/-	92/-	96/-	104/-	108/-
49	2/0½	4/1	24/6	49/-	73/6	77/7	81/8	85/9	89/10	93/11	98/-	106/2	110/3
50	2/1	4/2	25/-	50/-	75/-	79/2	83/4	87/6	91/8	95/10	100/-	108/4	112/6
51	2/1½	4/3	25/6	51/-	76/6	80/9	85/-	89/3	93/6	97/9	102/-	110/6	114/9
52	2/2	4/4	26/-	52/-	78/-	82/4	86/8	91/-	95/4	99/8	104/-	112/8	117/-
53	2/2½	4/5	26/6	53/-	79/6	83/11	88/4	92/9	97/2	101/7	106/-	114/10	119/3
54	2/3	4/6	27/-	54/-	81/-	85/6	90/-	94/6	99/-	103/6	108/-	117/-	121/6
55	2/3½	4/7	27/6	55/-	82/6	87/1	91/8	96/3	100/10	105/5	110/-	119/2	123/9
56	2/4	4/8	28/-	56/-	84/-	88/8	93/4	98/-	102/8	107/4	112/-	121/4	126/-
57	2/4½	4/9	28/6	57/-	85/6	90/3	95/-	99/9	104/6	109/3	114/-	123/6	128/3
58	2/5	4/10	29/-	58/-	87/-	91/10	96/8	101/6	106/4	111/2	116/-	125/8	130/6
59	2/5½	4/11	29/6	59/-	88/6	93/5	98/4	103/3	108/2	113/1	118/-	127/10	132/9
60	2/6	5/-	30/-	60/-	90/-	95/-	100/-	105/-	110/-	115/-	120/-	130/-	135/-

TABLE

2/4 per hour	2/5 per hour	2/6 per hour	2/9 per hour	3/- per hour	3/3 per hour	3/6 per hour	3/9 per hour	4/- per hour	4/3 per hour	4/6 per hour	4/9 per hour	5/- per hour
-/7	-/7¼	-/7½	-/8¼	-/9	-/9¾	-/10½	-/11¼	1/-	1/0¾	1/1½	1/2¼	1/3
1/2	1/2½	1/3	1/4½	1/6	1/7½	1/9	1/10½	2/-	2/1½	2/3	2/4½	2/6
1/9	1/9¾	1/10½	2/0¾	2/3	2/5¼	2/7½	2/9¾	3/-	3/2¼	3/4½	3/6¾	3/9
2/4	2/5	2/6	2/9	3/-	3/3	3/6	3/9	4/-	4/3	4/6	4/9	5/-
4/8	4/10	5/-	5/6	6/-	6/6	7/-	7/6	8/-	8/6	9/-	9/6	10/-
7/-	7/3	7/6	8/3	9/-	9/9	10/6	11/3	12/-	12/9	13/6	14/3	15/-
9/4	9/8	10/-	11/-	12/-	13/-	14/-	15/-	16/-	17/-	18/-	19/-	20/-
11/8	12/1	12/6	13/9	15/-	16/3	17/6	18/9	20/-	21/3	22/6	23/9	25/-
14/-	14/6	15/-	16/6	18/-	19/6	21/-	22/6	24/-	25/6	27/-	28/6	30/-
16/4	16/11	17/6	19/3	21/-	22/9	24/6	26/3	28/-	29/9	31/6	33/3	35/-
18/8	19/4	20/-	22/-	24/-	26/-	28/-	30/-	32/-	34/-	36/-	38/-	40/-
21/-	21/9	22/6	24/9	27/-	29/3	31/6	33/9	36/-	38/3	40/6	42/9	45/-
23/4	24/2	25/-	27/6	30/-	32/6	35/-	37/6	40/-	42/6	45/-	47/6	50/-
25/8	26/7	27/6	30/3	33/-	35/9	38/6	41/3	44/-	46/9	49/6	52/3	55/-
28/-	29/-	30/-	33/-	36/-	39/-	42/-	45/-	48/-	51/-	54/-	57/-	60/-
30/4	31/5	32/6	35/9	39/-	42/3	45/6	48/9	52/-	55/3	58/6	61/9	65/-
32/8	33/10	35/-	38/6	42/-	45/6	49/-	52/6	56/-	59/6	63/-	66/6	70/-
35/-	36/3	37/6	41/3	45/-	48/9	52/6	56/3	60/-	63/9	67/6	71/3	75/-
37/4	38/8	40/-	44/-	48/-	52/-	56/-	60/-	64/-	68/-	72/-	76/-	80/-
39/8	41/1	42/6	46/9	51/-	55/3	59/6	63/9	68/-	72/3	76/6	80/9	85/-
42/-	43/6	45/-	49/6	54/-	58/6	63/-	67/6	72/-	76/6	81/-	85/6	90/-
44/4	45/11	47/6	52/3	57/-	61/9	66/6	71/3	76/-	80/9	85/6	90/3	95/-
46/8	48/4	50/-	55/-	60/-	65/-	70/-	75/-	80/-	85/-	90/-	95/-	100/-
49/-	50/9	52/6	57/9	63/-	68/3	73/6	78/9	84/-	89/3	94/6	99/9	105/-
51/4	53/2	55/-	60/6	66/-	71/6	77/-	82/6	88/-	93/6	99/-	104/6	110/-
53/8	55/7	57/6	63/3	69/-	74/9	80/6	86/3	92/-	97/9	103/6	109/3	115/-
56/-	58/-	60/-	66/-	72/-	78/-	84/-	90/-	96/-	102/-	108/-	114/-	120/-
58/4	60/5	62/6	68/9	75/-	81/3	87/6	93/9	100/-	106/3	112/6	118/9	125/-
60/8	62/10	65/-	71/6	78/-	84/6	91/-	97/6	104/-	110/6	117/-	123/6	130/-
63/-	65/3	67/6	74/3	81/-	87/9	94/6	101/3	108/-	114/9	121/6	128/3	135/-
65/4	67/8	70/-	77/-	84/-	91/-	98/-	105/-	112/-	119/-	126/-	133/-	140/-
67/8	70/1	72/6	79/9	87/-	94/3	101/6	108/9	116/-	123/3	130/6	137/9	145/-
70/-	72/6	75/-	82/6	90/-	97/6	105/-	112/6	120/-	127/6	135/-	142/6	150/-
72/4	74/11	77/6	85/3	93/-	100/9	108/6	116/3	124/-	131/9	139/6	147/3	155/-
74/8	77/4	80/-	88/-	96/-	104/-	112/-	120/-	128/-	136/-	144/-	152/-	160/-
77/-	79/9	82/6	90/9	99/-	107/3	115/6	123/9	132/-	140/3	148/6	156/9	165/-
79/4	82/2	85/-	93/6	102/-	110/6	119/-	127/6	136/-	144/6	153/-	161/6	170/-
81/8	84/7	87/6	96/3	105/-	113/9	122/6	131/3	140/-	148/9	157/6	166/3	175/-
84/-	87/-	90/-	99/-	108/-	117/-	126/-	135/-	144/-	153/-	162	171/-	180/-
86/4	89/5	92/6	101/9	111/-	120/3	129/6	138/9	148/-	157/3	166/6	175/9	185/-
88/8	91/10	95/-	104/6	114/-	123/6	133/-	142/6	152/-	161/6	171/-	180/6	190/-
91/-	94/3	97/6	107/3	117/-	126/9	136/6	146/3	156/-	165/9	175/6	185/3	195/-
93/4	96/8	100/-	110/-	120/-	130/-	140/-	150/-	160/-	170/-	180/-	190/-	200/-
95/8	99/1	102/6	112/9	123/-	133/3	143/6	153/9	164/-	174/3	184/6	194/9	205/-
98/-	101/6	105/-	115/6	126/-	136/6	147/-	157/6	168/-	178/6	189/-	199/6	210/-
100/4	103/11	107/6	118/3	129/-	139/9	150/6	161/3	172/-	182/9	193/6	204/3	215/-
102/8	106/4	110/-	121/-	132/-	143/-	154/-	165/-	176/-	187/-	198/-	209/-	220/-
105/-	108/9	112/6	123/9	135/-	146/3	157/6	168/9	180/-	191/3	202/6	213/9	225/-
107/4	111/2	115/-	126/6	138/-	149/6	161/-	172/6	184/-	195/6	207/-	218/6	230/-
109/8	113/7	117/6	129/3	141/-	152/9	164/6	176/3	188/-	199/9	211/6	223/3	235/-
112/-	116/-	120/-	132/-	144/-	156/-	168/-	180/-	192/-	204/-	216/-	228/-	240/-
114/4	118/5	122/6	134/9	147/-	159/3	171/6	183/9	196/-	208/3	220/6	232/9	245/-
116/8	120/10	125/-	137/6	150/-	162/6	175/-	187/6	200/-	212/6	225/-	237/6	250/-
119/-	123/3	127/6	140/3	153/-	165/9	178/6	191/3	204/-	216/9	229/6	242/3	255/-
121/4	125/8	130/-	143/-	156/-	169/-	182/-	195/-	208/-	221/-	234/-	247/-	260/-
123/8	128/1	132/6	145/9	159/-	172/3	185/6	198/9	212/-	225/3	238/6	251/9	265/-
126/-	130/6	135/-	148/6	162/-	175/6	189/-	202/6	216/-	229/6	243/-	256/6	270/-
128/4	132/11	137/6	151/3	165/-	178/9	192/6	206/3	220/-	233/9	247/6	261/3	275/-
130/8	135/4	140/-	154/-	168/-	182/-	196/-	210/-	224/-	238/-	252/-	266/-	280/-
133/-	137/9	142/6	156/9	171/-	185/3	199/6	213/9	228/-	242/3	256/6	270/9	285/-
135/4	140/2	145/-	159/6	174/-	188/6	203/-	217/6	232/-	246/6	261/-	275/6	290/-
137/8	142/7	147/6	162/3	177/-	191/9	206/6	221/3	236/-	250/9	265/6	280/3	295/-
140/-	145/-	150/-	165/-	180/-	195/-	210/-	225/-	240/-	255/-	270/-	285/-	300/-

TABLE OF SUPERFICIAL YARDS

This table gives at a glance the number of superficial yards on the walls of any room up to 15 ft high and up to 100 ft around the sides of a room. The measurements are given for 3, 6 and 9 in., for 1, 2, 3 ft, etc., in order that these figures may be added to the higher figures and thus simplify the more involved types of calculations.

FEET	28	32	36	40	44	48	52	56	60	64
Height										
3 inches	7/9	8/9	1	1 1/9	1 2/9	1 1/3	1 4/9	1 5/9	1 2/3	1 7/9
6	1 5/9	1 7/9	2	2 2/9	2 4/9	2 2/3	2 8/9	3 1/9	3 1/3	3 5/9
9	2 1/3	2 2/3	3	3 1/3	3 2/3	4	4 1/3	4 2/3	5	5 1/3
1 foot	3 1/9	3 5/9	4	4 4/9	4 8/9	5 1/3	5 7/9	6 2/9	6 2/3	7 1/9
2 feet	6 2/9	7 1/9	8	8 8/9	9 7/9	10 2/3	11 5/9	12 4/9	13 1/3	14 2/9
3	9 1/3	10 2/3	12	13 1/3	14 2/3	16	17 1/3	18 2/3	20	21 1/3
4	12 4/9	14 2/9	16	17 7/9	19 5/9	21 1/3	23 1/9	24 8/9	26 2/3	28 4/9
5	15 5/9	17 7/9	20	22 2/9	24 4/9	26 2/3	28 8/9	31 1/9	33 1/3	35 5/9
6	18 2/3	21 1/3	24	26 2/3	29 1/3	32	34 2/3	37 1/3	40	42 2/3
7	21 7/9	24 8/9	28	31 1/9	34 2/9	37 1/3	40 4/9	43 5/9	46 2/3	49 7/9
8	24 8/9	28 4/9	32	35 5/9	39 1/9	42 2/3	46 2/9	49 7/9	53 1/3	56 8/9
9	28	32	36	40	44	48	52	56	60	64
10	31 1/9	35 5/9	40	44 4/9	48 8/9	53 1/3	57 7/9	62 2/9	66 2/3	71 1/9
11	34 2/9	39 1/9	44	48 8/9	53 7/9	58 2/3	63 5/9	68 4/9	73 1/3	78 2/9
12	37 1/3	42 2/3	48	53 1/3	58 2/3	64	69 1/3	74 2/3	80	85 1/3
13	40 4/9	46 2/9	52	57 7/9	63 5/9	69 1/3	75 1/9	80 8/9	86 2/3	92 4/9
14	43 5/9	49 7/9	56	62 2/9	68 4/9	74 2/3	80 8/9	87 1/9	93 1/3	99 5/9
15	46 2/3	53 1/3	60	65 5/9	73 1/3	80	86 2/3	93 1/3	100	106 2/3

FEET	68	72	76	80	84	88	92	96	100
Height									
3 inches	1 8/9	2	2 1/9	2 2/9	2 1/3	2 4/9	2 5/9	2 2/3	2 7/9
6	3 7/9	4	4 2/9	4 4/9	4 2/3	4 8/9	5 1/9	5 1/3	5 5/9
9	5 2/3	6	6 1/3	6 2/3	7	7 1/3	7 2/3	8	8 1/3
1 foot	7 5/9	8	8 4/9	8 8/9	9 1/3	9 7/9	10 2/9	10 2/3	11 1/9
2 feet	15 1/9	16	16 8/9	17 7/9	18 2/3	19 5/9	20 4/9	21 1/3	22 2/9
3	22 2/3	24	25 1/3	26 2/3	28	29 1/3	30 2/3	32	33 1/3
4	30 2/9	32	33 7/9	35 5/9	37 1/3	39 1/9	40 8/9	42 2/3	44 4/9
5	37 7/9	40	42 2/9	44 4/9	46 2/3	48 8/9	61 1/9	53 1/3	55 5/9
6	45 1/3	48	50 2/3	53 1/3	56	58 2/3	61 1/3	64	66 2/3
7	52 8/9	56	59 1/9	62 2/9	65 1/3	68 4/9	71 5/9	74 2/3	77 7/9
8	60 4/9	64	67 5/9	71 1/9	74 2/3	78 2/9	81 7/9	85 1/3	88 8/9
9	68	72	76	80	84	88	92	96	100
10	75 5/9	80	84 4/9	88 8/9	93 1/3	97 7/9	102 2/9	106 2/3	111 1/9
11	83 1/9	88	92 8/9	97 7/9	102 2/3	107 5/9	112 4/9	117 1/3	122 2/9
12	90 2/3	96	101 1/3	106 2/3	112	117 1/3	122 2/3	128	133 1/3
13	98 2/9	104	109 7/9	115 5/9	121 1/3	127 1/9	132 8/9	138 2/3	144 4/9
14	105 7/9	112	118 2/9	124 4/9	130 2/3	136 8/9	143 1/9	149 1/3	155 5/9
15	113 1/3	120	126 2/3	133 1/3	140	146 2/3	153 1/3	160	166 2/3

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